



Montana Statewide Water Quality Monitoring and Assessment Strategy: 2020 – 2030



Commented [LT1]: I would recommend that each section include a “needs assessment” that identifies gaps in each area. Without that information, the list of short-term priorities seems disconnected from the other program work.

Wetlands and GW are mentioned under monitoring but it was unclear to me whether the QA and data management sections also covered those waterbody types.

Commented [LT2R1]: Note from Liz: is 10 years too long? What about 5 years? Easier to establish realistic priorities in a shorter timeframe.

Commented [LT3R1]: We should chat with MDEQ re. gaps and how to understand current work.

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ACRONYMS

AIS	Aquatic Invasive Species
ARM	Administrative Rules of Montana
ATTAINS	Assessment, Total Maximum Daily Load (TMDL) Tracking and Implementation System
BLM	Bureau of Land Management
BMP	Best Management Practices
BUA	Beneficial Use Assessment
CFRWQMC	Clark Fork River Water Quality Monitoring Committee
CMDP	Compliance Monitoring Data Portal
CWA	Clean Water Act
CWAIC	Clean Water Act Information Center
DEQ	Department of Environmental Quality
DMR	Discharge Monitoring Report
DNRC	Department of Natural Resources and Conservation
DO	Dissolved oxygen
DPHHS	Department of Public Health and Human Services
DQA	Data Quality Assessment
EA	Environmental Assessment
EB	Engineering Bureau
EC	Electrical conductivity
EDD	Electronic Data Deliverable
EDP	EQulS Data Processor
EPA	Environmental Protection Agency
FACTS	Fees, Applications, and Compliance Tracking System
FERC	Federal Energy Regulatory Commission
FWP	Fish, Wildlife and Parks

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GIS	Geographic Information System
GWIC	Ground Water Information Center
GWIP	Ground Water Investigation Program
HAB	Harmful Algal Bloom
HUC	Hydrologic Unit Code
ICIS	Integrated Compliance Information System
LIDAR	Light Detection and Ranging
MBMG	Montana Bureau of Mines and Geology
MCA	Montana Code Annotated
MGWPCS	Montana Groundwater Pollution Control System
MIM	Multiple Indicator Monitoring
MPDES	Montana Pollutant Discharge Elimination System
MSUEWQ	Montana State University Extension Water Quality
MWCC	Montana Watershed Coordination Council
NARS	National Aquatic Resource Surveys
NHD	National Hydrography Dataset
NLA	National Lakes Assessment
NRCS	Natural Resources Conservation Service
NRSA	National Rivers and Streams Assessment
NWCA	National Wetland Condition Assessment
NWQI	National Water Quality Initiative
NPS	Nonpoint Source
PCS	Potential Contaminant Source
PER	Project Effectiveness Review
PFAS	Per- and polyfluoroalkyl substances
PFC	Proper Functioning Condition
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PIBO	PACFISH/INFISH Biological Opinion
PM2	Potential Projects Mapping Method
PPG	Performance Partnership Grant
PWS	Public Water Supply
PWSB	Public Water Supply Bureau
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMP	Quality Management Plan
RIM	Records and Information Management
RMP	Records Management Plan
SAP	Sampling and Analysis Plan
SAR	Sodium Adsorption Ratio
SDWA	Safe Drinking Water Act
SDWIS	Safe Drinking Water Information System
SOP	Standard Operating Procedure
STAG	Statewide TMDL Advisory Group
SUDS	STORET User Data System
SVF	Site Visit Form
SWAMP	Surface Water Assessment and Monitoring Program

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SWDAR	Source Water Delineation and Assessment Report
SWPP	Source Water Protection Program
TIE	TMDL Implementation Evaluation
TMDL	Total Maximum Daily Loads
UAA	Use Attainability Analysis
USFS	United States Forest Service
USGS	United States Geological Survey
VM	Volunteer Monitoring
VMLASP	Volunteer Monitoring Lab Analysis Support Program
WARD	Water Quality Assessment, Reporting, and Documentation
WPB	Water Protection Bureau
WQD	Water Quality Division
WQIR	Water Quality Integrated Report
WQPB	Water Quality Planning Bureau
WQS	Water Quality Standards
WRP	Watershed Restoration Plan
WRA	Watershed Risk Assessment

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Revision History:

Revision Date	Version number	Summary of change(s)	Revised sections(s)	Revised by
May 2021	1.0	Initial document	All	Katie Makarowski

1.0 INTRODUCTION

Montana is the fourth largest state (147,040 square miles) and many of the factors that influence water quality, such as geology, elevation, and land use, vary drastically across the state. Montana has almost 60,000 miles of perennial rivers and streams, more than 300,000 miles of intermittent and ephemeral streams, over 700,000 acres of lakes and reservoirs, over 2.5 million acres of mapped wetlands and over 600,000 acres of mapped riparian areas. Montana's headwaters drain to three major river basins: the Clark Fork and Kootenai rivers and their tributaries feed the Columbia River system which empties into the Pacific Ocean; the Missouri River and tributaries (including the Yellowstone and Little Missouri) join the Mississippi which drains into the Gulf of Mexico; and the St. Mary's River feeds the north-flowing Saskatchewan River which empties into Hudson Bay (Higgins, 1996).

Montana's waters support valuable beneficial uses for Montanans such as drinking water (after treatment), contact recreation such as swimming and boating, fish and aquatic life, and agricultural and industrial water uses. About 61% of the state's population gets their drinking water from groundwater and the remainder is from surface water sources.

Montana Department of Environmental Quality (DEQ) is responsible for protecting and maintaining the quality of state water resources and administers several water programs to achieve water quality goals. Monitoring is a tool employed by DEQ and its partners to inform water quality management decisions.

1.1 PURPOSE

This document outlines the monitoring strategy that DEQ will apply during the ten-year period from 2020-2030 to assess and manage state water resources. The document is structured according to EPA's recommended elements of a state monitoring and assessment program (EPA, 2003). Monitoring approaches used by DEQ's regulatory and non-regulatory programs are summarized (**Section 4.0**), program needs are identified, and an implementation schedule distinguishes between short- and long-term priorities (**Section 10.0**). This strategy will be used to inform workplans and help identify opportunities for monitoring partnerships and data sharing.

Commented [LT4]: Shouldn't this be 2021? Or are we going by decades?

DEQ's previous monitoring strategy for 2009 to 2019 (DEQ, 2009) focused heavily on requirements of a Total Maximum Daily Load (TMDL) lawsuit Consent Decree and the 2012 TMDL court deadline. Since completing these legal requirements, DEQ's water programs have been looking forward and shaping new priorities. In 2019, three programs within the Water Quality Division (Monitoring and Assessment, TMDL, and Nonpoint Source) developed 20-year strategic plans to guide future activities (DEQ, 2019a; 2019b; 2019c). These strategic plans emphasize demonstrating measurable progress toward achieving goals set forth in the Montana Water Quality Act and federal Clean Water Act. This 10-year monitoring strategy aligns with these programs' strategic plans and provides additional detail about these and other programs' monitoring approaches.

Commented [LT5]: Will want to make sure these strategies are included as references (at a minimum) or as appendices.

1.2 WATER QUALITY PROGRAM SUMMARY

Since the 2009-2019 monitoring strategy was written (DEQ, 2009), DEQ shifted its organizational structure and grouped most of its water programs under the Water Quality Division (WQD) (previously the Planning, Prevention, and Assistance Division). The WQD is now comprised of four bureaus (**Figure 1**): Water Quality Planning, Public Water Supply, Water Protection, and Engineering.

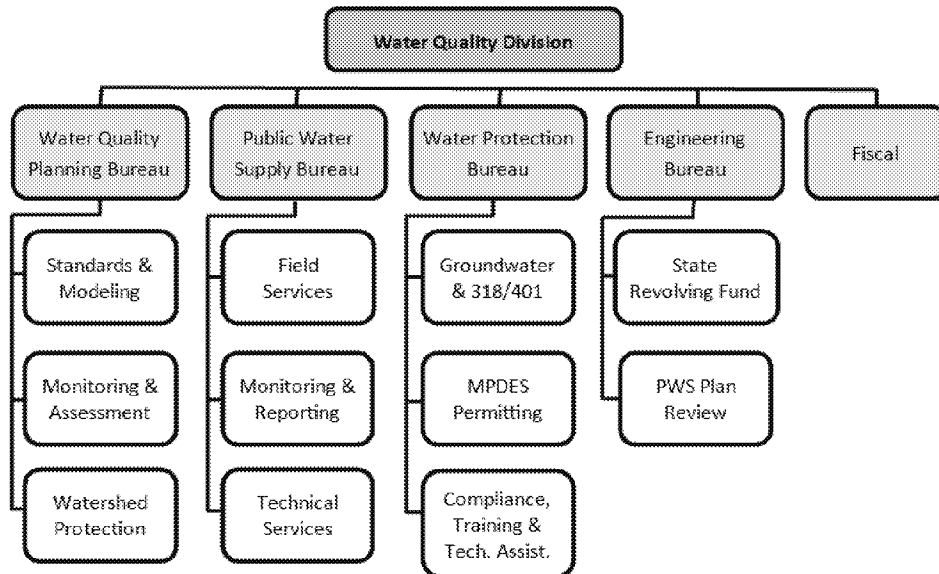


Figure 1. Water Quality Division Organizational Structure

Water Quality Planning Bureau (WQPB)

- The Standards and Modeling Section develops water quality standards which form the legal basis for controls on the amount of pollution entering Montana’s waters.
- The Monitoring and Assessment Section monitors, assesses, and reports on the status and trends of surface water quality and identifies pollutants that impair beneficial uses.
- The Watershed Protection Section develops total maximum daily load(s) to determine how much pollution a water can sustain and recommend pollution reduction measures, administers 319 funds for projects that reduce nonpoint source pollution, supports local watershed restoration planning, and coordinates wetland conservation activities statewide.

Public Water Supply Bureau (PWSB)

- The Field Services Section conducts sanitary survey and compliance inspections, technical and compliance assistance, formal and informal training for water system owners and operator, as well as assisting other division staff in the completion of their duties.
- The Monitoring and Reporting Section manages drinking water rules, oversees monitoring, tracks compliance and drinking water advisories, and performs training and technical assistance.
- The Technical Services Section approves training and provides technical assistance for water treatment operator certification, certified labs, and manages Safe Drinking Water Database, Public Water Supply Database and Lead in Schools Database.

Water Protection Bureau (WPB)

- The Groundwater and 318/401 Section issues permits under the Montana Groundwater Pollution Control System (MGWPCS), conducts Section 401 water quality certifications for

projects for federally approved projects that may affect surface waters, provide Section 318 authorizations for short-term construction activities that could result in a release of sediment or turbid water, and implements the Source Water Protection Program (SWPP).

- The Montana Pollutant Discharge Elimination System (MPDES) Permitting Section issues pollution discharge permits to regulate the discharge of pollution into state waters.
- The Compliance, Training and Technical Support Section conducts compliance inspections for permitted facilities, manages discharge monitoring data submitted by permittees, and provides training and technical assistance for wastewater operators.

Engineering Bureau (EB)

- Public Water and Wastewater Plan Review Section reviews plans and specifications for new public water and wastewater systems and alterations to existing systems.
- The Drinking Water and Water Pollution Control State Revolving Fund (SRF) programs provide at or below market interest rate loans to eligible Montana entities for infrastructure projects.

2.0 MONITORING OBJECTIVES

Commented [LT6]: What about non-CWA monitoring objectives? SDWA?

DEQ's monitoring objectives are founded on the goals of the Montana Water Quality Act and the federal Clean Water Act and they reflect the decision needs of DEQ's water programs.

Objective 1 - Establish, review and revise water quality standards.

DEQ establishes water quality standards (WQS) to determine what level of protection is needed to protect beneficial uses of state waters and performs a triennial review of existing WQS to evaluate whether revisions or additions are necessary. DEQ conducts use attainability analyses (UAAs) to determine which beneficial uses should or should not be designated to a waterbody.

Objective 2 - Evaluate and describe water quality conditions.

DEQ reports water quality status, identifies waters that are threatened or impaired (i.e., not attaining water quality standards) and their cause and sources of impairment, and identifies high quality waters that are attaining water quality standards.

Objective 3 - Investigate water quality problems and emerging concerns.

DEQ investigates suspected water quality problems often in response to stakeholder concerns, monitors emerging pollutants, and participates in emergency response teams for spills, leaks, and other unforeseen events.

Objective 4 - Support implementation of water quality management plans and control programs.

DEQ administers programs aimed at controlling nonpoint and point sources of pollution to state waters; each of these programs require quality data to make informed decisions (e.g., total maximum daily loads (TMDLs), watershed restoration planning and project implementation, effluent limits in discharge permits, compliance evaluations for water and wastewater systems).

Objective 5 - Track water quality change over time.

DEQ tracks long-term water quality trends (improving or declining) which generally involve robust datasets and statistical analyses and typically accounts for variables such as climate and hydrology.

Objective 6 - Evaluate effectiveness of pollution control programs.

DEQ evaluates water quality to demonstrate whether DEQ and others' actions to control pollution are effective, that is, whether they successfully result in measurable water quality improvements. This includes point and nonpoint source pollution controls, optimization of water and wastewater infrastructure, and remediation or restoration of polluted sites.

Objective 7 - Protect public health.

DEQ inspects and evaluates compliance of public water systems, helps communities protect drinking water sources, helps educate the public about environmental factors that could be harmful to human health such as fish consumption advisories and potentially toxic harmful algal blooms, and other measures to protect public health.

Objective 8 – Inform and support people working to protect and improve water quality.

As a public agency, DEQ strives to provide useful information and good customer service to inform the public and support people working to protect and improve water quality. DEQ makes information available to the public using plain language, user-friendly reporting mechanisms, and publicly accessible databases. DEQ actively promotes data sharing among DEQ programs and with external entities. As resources allow, DEQ provides funding, technical services, equipment, and other support to partners when objectives align. DEQ also enables public participation through public comment periods and other means.

3.0 STRATEGIC MONITORING APPROACHES

Several key concepts, monitoring strategies and study designs are applied by DEQ water programs.

3.1 WATER QUALITY PLANNING PROCESS

DEQ's water quality planning process for surface waters (**Figure 2**) is applied in watersheds across Montana to investigate water quality conditions and guide water quality protection and improvement activities. The process is cyclic as waterbodies are revisited and reassessed through time.

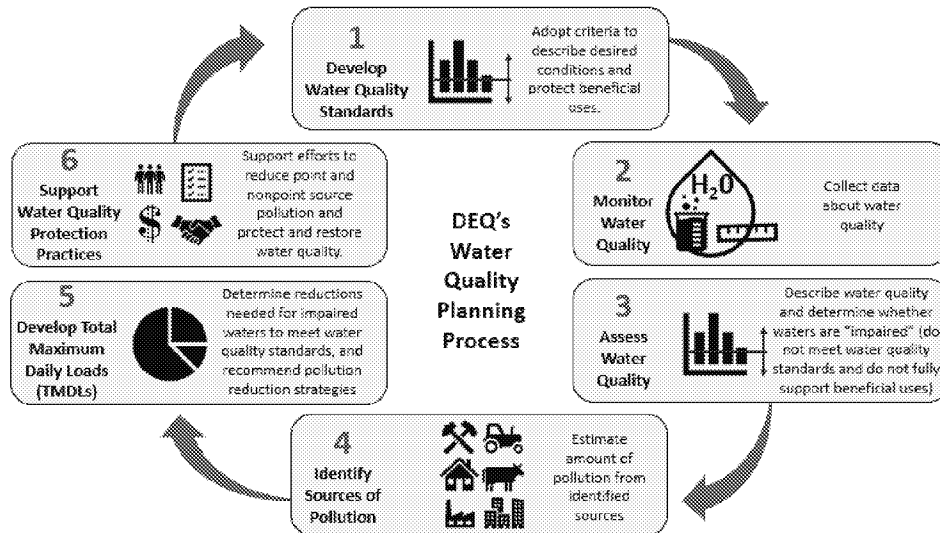


Figure 2. DEQ's Water Quality Planning Process

Standards: DEQ establishes water quality standards to protect beneficial uses of state waters. Standards describe the desired condition of a waterbody and form the regulatory basis for protecting water quality and establishing water-quality based treatment controls and strategies.

Monitoring: DEQ monitors state waters to produce credible data that can be used to assess water quality and uses data from secondary sources if it meets data quality requirements.

Assessment: DEQ assesses whether waterbodies meet water quality standards and support beneficial uses following data quality requirements and decision frameworks set forth in the Beneficial Use Assessment Method (Makarowski, 2020a) and associated parameter-specific assessment methods. DEQ maintains Montana's list of impaired waters and reports probable causes and sources of impairment.

Commented [LT7]: Note: check to make sure AMs are noted as an area for improvement in the document.

Total Maximum Daily Load (TMDL) Development: For each pollutant cause of impairment, DEQ develops a TMDL which is the maximum amount of a pollutant a waterbody can receive from all sources and still meet water quality standards. During TMDL development, DEQ also identifies sources of pollutants, allocates the allowable pollutant load among all sources (i.e., wasteload allocations for point sources and load allocations for nonpoint sources), and makes recommendations for achieving load reductions.

Water Quality Protection: DEQ provides funding and technical support to promote voluntary implementation of reasonable land, soil, and water conservation practices to reduce nonpoint sources of pollution. For point sources, DEQ issues Montana Pollutant Discharge Elimination System (MPDES) discharge permits to regulate and limit the amount of pollutants that can be discharged to state surface waters.

3.2 WATERSHED APPROACH

The watershed approach (EPA, 1996) is a widely applied coordinating framework for environmental management that focuses efforts to address the highest priority problems within watersheds and has three guiding principles which DEQ applies during assessment:

1. **Partnerships:** Throughout the watershed planning process, DEQ partners with stakeholders and other programs and agencies to gather and share information, identify local priorities, and leverage resources. DEQ also provides opportunities for public comment and stakeholder involvement throughout the water quality planning process.
2. **Geographic Focus:** Watersheds are effective units for water resource planning because they link water resources with the surrounding land use activities that influence water quality. DEQ often conducts assessments and other water quality management activities at a watershed scale, addressing multiple waterbodies, beneficial uses, and a variety of pollution causes and sources. DEQ also acknowledges water quality is one of many interrelated watershed resource issues.
3. **Sound Management Techniques based on Strong Science and Data:** DEQ develops science-based water quality standards, applies watershed risk assessment to understand sources and pathways of pollution and to focus efforts toward addressing priority issues in a watershed, applies standard operating procedures and data quality assessment to ensure data used during assessment is high quality, develops assessment methods to promote consistent and accurate assessment decisions, and reassesses waters to reflect new data and current conditions.

Commented [LT8]: What about gaps...?

3.3 WATERSHED RISK ASSESSMENT

Watershed risk assessment (WRA) is a process of collecting, organizing, and analyzing scientific information to evaluate the likelihood that adverse ecological effects occur due to exposure to one or more stressors and their probable sources in the watershed (EPA, 2008). DEQ applies WRA principles to varying degrees when scoping assessment projects depending on resource availability and project flexibility. WRA helps ensure that assessment projects focus on the most prevalent human sources of pollution and the causes of impairment most closely linked to those sources. WRA also helps managers prioritize activities that are most likely to achieve environmental goals and to focus limited resources.

Assessors document the presence, extent, and proximity of probable human sources of pollution and use this information to rank risk of water quality impairment (e.g., low to severe). This process can help identify waters at risk of impairment as well as waters that are likely not impaired but need protection. To determine the scope of an assessment project, risk rankings are coupled with other considerations such as the degree to which reasonable land, soil and water conservation practices are currently in place, stakeholder interests, and resource availability.

Commented [LT9]: Difficult to do if they don't address E&A available data issues for all potential parameters. Comments?

3.4 MONITORING PARTNERSHIPS

Many entities collect water quality data in Montana, including federal and state agencies, local governments, community groups, universities, and others. Monitoring partnerships among DEQ programs and with external entities increase the quantity of high-quality data available for making informed decisions. DEQ supports and promotes monitoring partnerships:

- Engage in monitoring partnerships when objectives overlap and efficiencies can be gained.

- Use financial and other mechanisms (e.g., memorandums of agreement, contracts) to formalize monitoring and data sharing agreements.
- Support volunteer monitoring and citizen science activities (**Section 3.5**).
- Share technical guidance and expertise with monitoring partners including monitoring protocols, monitoring designs, sampling and analysis plans, training, data management systems, and quality assurance systems.
- Lend water quality monitoring equipment and supplies to partners.
- Support the continuation of long-term water resource monitoring networks (**Section 4.9**).

3.5 VOLUNTEER MONITORING SUPPORT PROGRAM

Montana has a growing network of people voluntarily collecting water quality data. Many volunteer monitoring (VM) efforts are administered by non-profit watershed groups or other education or conservation organizations, conservation districts, and local water quality protection districts. Each group is uniquely motivated, although there is often similarity among groups' monitoring objectives and their desire to share high quality data with decision-makers. DEQ administers a Volunteer Monitoring Support Program to help ensure that VM programs have the technical and financial capacity to collect quality data across the state (Makarowski, 2021).

The four pillars of DEQ's Volunteer Monitoring Support Program are:

1. Financial Support (e.g., Volunteer Monitoring Lab Analysis Support Program (VMLASP))
2. Material Support (e.g., equipment, consumable supplies)
3. Technical Support (e.g., sampling and analysis plan (SAP) review, guidance documents, trainings, data management, data analysis and reporting, technical advising, and mentoring)
4. Partnerships to Support Volunteer Monitoring (e.g., Montana State University Extension Water Quality (MSUEWQ) Program, Montana Watershed Coordination Council (MWCC))

3.6 REGULATORY MONITORING REQUIREMENTS

Many of DEQ's regulatory pollution control programs require monitoring that is specified in permits or licenses, including which analytes, frequency, methods, etc. This required monitoring is used to evaluate compliance, track violations, and implement corrective actions to bring permitted dischargers and water and wastewater systems into compliance to protect human health and the environment.

3.7 PRIORITIZING WATERSHEDS FOR ASSESSMENT

Watersheds are prioritized for assessment and subsequent water quality planning activities (**Section 3.1**) in coordination with DEQ water programs, the Statewide TMDL Advisory Group (STAG), EPA, and other stakeholders. Criteria that may be considered when prioritizing assessment projects include:

- **Stakeholder and community interest:** DEQ receives input from local, state and federal stakeholders about water quality interests and concerns. Many watershed improvement activities are implemented voluntarily and are most successful when community led.

Commented [LT10]: What about "existing data" is available?

- **DEQ water program integration:** DEQ water programs coordinate to leverage resources toward water quality improvement in watersheds where program objectives align (e.g., jointly select focus watersheds to concentrate point and non-point source technical and financial support and track water quality improvements).
- **State TMDL Advisory Group (STAG) input:** Assessment and TMDL development projects are solicited and vetted by STAG which serves in an advisory capacity and represents diverse water-related interests (75-5-702(9), MCA).
- **Inter-agency coordination:** Assessment projects may be coordinated with other agencies where common objectives align.
- **Watershed value:** Areas that provide extraordinary ecological or aesthetic value may be prioritized, especially if communities rely heavily on good water quality for economic or social wellbeing and widespread water quality threats or improvements are occurring.
- **Time lapse since previous assessments:** Water quality conditions are periodically reassessed with current information if substantial time has lapsed or if changes are suspected since previous assessments.
- **Extent of existing or emerging human sources of degradation:** DEQ prioritizes areas where water quality is at high risk of degradation due to existing or emerging human sources.
- **Availability of agency resources:** Resources must be available for all phases of an assessment project, including monitoring, analysis and decision-making, reporting, and outreach. Assessment projects often span multiple years and involve several staff.
- **External resources:** DEQ may prioritize or broaden the scope of assessment projects when additional resources are available from stakeholders or partners.
- **Availability of assessment tools:** Assessment tools such as water quality standards, monitoring protocols and assessment methods are necessary for DEQ to effectively make accurate and credible assessment decisions.
- **Other factors:** While prioritizing agency resources, managers may need to consider unforeseen factors that arise.

4.0 MONITORING PROGRAM SUMMARY

Monitoring is a means of obtaining environmental data used to achieve objectives and inform decisions. Some DEQ programs conduct monitoring themselves, some require other entities to conduct monitoring, and some rely heavily on data that DEQ or others collect. This section contains a brief overview of monitoring approaches used to achieve key objectives of the Water Quality Division (WQD) (Section 2.0). Several key monitoring efforts led by DEQ's partners are also summarized. Other DEQ divisions conduct monitoring and have data needs (e.g., Remediation, Enforcement, Mining) but are generally outside the scope of this document.

4.1 OVERVIEW

Each monitoring program is applicable to one or more water resource type (Table 1).

Commented [LT11]: This section varies in the extent to which it describes the monitoring design. Needs to include more design details to inform site selection/

What about areas of improvements? New programs?

The monitoring design explains how monitoring sites are selected to meet monitoring objectives, including providing water quality data of documented quality for many purposes such as setting water quality standards, assessing overall water conditions, listing impaired waters, developing TMDLs, and writing NPDES permits. To meet The monitoring design explains how monitoring sites are selected to meet monitoring objectives, including providing water quality data of documented quality for many purposes such as setting water quality standards, assessing overall water conditions, listing impaired waters, developing TMDLs, and writing NPDES permits. To meet

Table 1. Monitoring objectives and programs per water resource type.

Objective	Program	River/ Stream	Lake/ Reservoir	Wetland	Ground water	Drinking Water
1 - Establish water quality standards	State-Driven Standards Development	X	X		X	X
	Federal Recommended Criteria (Section 304(a)) Implementation	X	X		X	X
	Use Attainability Analysis	X	X			
	Reference Stream Project	X				
2 - Evaluate and describe water quality conditions	Beneficial Use Assessment	X	X			X
	Watershed Characterization Monitoring	X	X			
	Wetland Monitoring			X		
	National Aquatic Resource Surveys	X	X	X		
	Biological Assessments	X	X			
3 - Investigate water quality problems and emerging concerns	Harmful Algal Blooms	X	X			
	Per- and Polyfluoroalkyl Substances	X	X		X	X
	Emergency Response	X	X	X	X	X
	Other Emerging Concerns	X	X	X	X	X
4 - Support implementation of water quality management plans and control programs	TMDL and Source Assessment	X	X			
	Potential Projects Mapping	X	X			
	Regional or Cross-Boundary Initiatives	X	X		X	
	MPDES Permit Development and Renewal	X	X			
	Source Water Protection Program				X	X
	410 Water Quality Certifications	X	X			
5 - Track change	Trend Monitoring	X	X			
6 - Evaluate effectiveness of pollution control programs	Nonpoint Source Focus Watersheds	X	X	X		
	National Water Quality Initiative	X				
	Nonpoint Source (319) Success Stories	X	X			
	TMDL Implementation Evaluations	X	X	X		
	319 Project Effectiveness and Load Reduction Monitoring	X	X			
	Project Evaluation Reviews	X	X			
	MPDES Effluent Monitoring	X	X			
	Groundwater Permit Compliance Monitoring				X	
7 - Protect public health	Public Water Supply Monitoring					X
	Lead in Schools Drinking Water Program					X

Commented [LT12]: Josh/Liz: Is this table helpful?

Commented [LT13]: Please describe. Not aware of any work here.

Commented [LT14]: Same note as above.

Commented [LT15]: Which of these are top priorities? Many are similar to the previous strategy? What is new that is being done? What, if anything, is being done with the reference data?

Commented [LT16]: But this isn't currently being done?

Commented [LT17]: Where is MT's wetland AM?

Commented [LT18]: What is this? Please describe how the state is doing biological assessments. What is the plan to interpret biological data?

Commented [LT19]: ?? please describe.

Commented [LT20]: Need more details.

Commented [LT21]: How.. what methods are in place to do this? For what parameters?

4.2 OBJECTIVE 1 - ESTABLISH, REVIEW AND REVISE WATER QUALITY STANDARDS

State-Driven Standards Development

Description: Water quality standards (WQS) are used as benchmarks when protecting and maintaining water quality and serve as the regulatory basis for the establishment of water-quality based treatment controls and strategies. WQS consist of three elements (75-5-301, MCA): 1) beneficial uses a waterbody is expected to support, 2) criteria that defines the water quality necessary to protect beneficial uses, and 3) nondegradation requirements to protect existing uses and prevent degradation of high-quality waters. DEQ develops WQS and revises WQS as needed during a triennial review period.

Monitoring Approach: DEQ conducts research projects to obtain data to be used when developing or revising WQS. Research projects use experimental designs to test hypotheses. For example, WQS research projects may be to determine cause and effect (e.g., dosing studies), to evaluate harm to beneficial uses, to determine site-specific standards for a specific region or waterbody, or to produce data inputs used when applying computer water quality models.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs, Groundwater; Drinking Water

Federal Recommended Criteria (Section 304(a)) Implementation

Description: EPA compiles national recommended water quality criteria for the protection of aquatic life and human health in surface water for approximately 150 pollutants. These criteria are published pursuant to Section 304(a) of the Clean Water Act (CWA) and provide guidance for states and tribes to use to establish water quality standards and ultimately provide a basis for controlling discharges or releases of pollutants.

Monitoring Approach: When Montana implements federal national recommended water quality criteria, monitoring needs are not as extensive as when developing state-driven criteria. However, Montana may conduct monitoring to demonstrate how federal recommended criteria can best apply to Montana's waters based on site or region or water use classifications.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs, Groundwater; Drinking Water

Use Attainability Analyses (UAAs)

Description: Use attainability analysis (UAA) is a process for reviewing and revising designated uses and entails a structured scientific assessment of the factors affecting the attainment of beneficial uses (EPA, 2020). A UAA may be appropriate if a waterbody does not appear to be capable of supporting some of its designated beneficial uses or was never capable of historically supporting these uses. This could be a result of a natural condition or a human-caused influence that has altered the condition of the waterbody. A UAA may result in the upgrade, subcategorization, or removal of a beneficial use (WQSMS, 2018).

Monitoring Approach: A UAA can be carried out without monitoring if data exists although, in most cases, data collection is necessary to address specific scientific questions and associated hypotheses to be tested. When data collection for a UAA is complete, the results are analyzed and presented in a technical support document. Key determinations include whether the designated use—or some identifiable degree of it—has existed since 1971, and whether water quality that supports the use has been achieved since 1971 (i.e., are WQS met) (WQSMS, 2018).

Commented [LT22]: It would be helpful to discuss the monitoring design in this section.

How can EPA understand what monitoring work the state is doing each year? Should that be documented here? Or elsewhere?

Commented [LT23]: Please provide more details: what UAA work is MT doing or thinks they may do in the next 10 years. Please elaborate.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs

Reference Stream Project

Description: The reference condition concept asserts that relatively undisturbed examples of waterbodies can represent the natural biological, chemical, and physical integrity of a region. DEQ uses data from reference sites when developing water quality standards and when interpreting narrative standards as a point of comparison for geologically similar study streams. DEQ’s reference sites are grouped into two tiers: Tier 1 (natural condition) sites are unaltered from their natural state with no detectable human-caused changes; Tier 2 (minimally impacted condition) sites reflect areas where human activities have made small changes that do not affect the completeness of the biotic community structure and function and the associated physical, chemical, and habitat conditions. A third category, comparison sites, fail one or more key category but are still useful for other characteristic comparisons (e.g., fail metals but could be used for riparian habitat comparisons) (Sada and Suplee, 2020).

Monitoring Approach: DEQ’s Reference Stream Project reference site selection process focuses mainly on watershed- and local-scale anthropogenic signatures such as road density, timber harvest density, and proportion of agricultural land use (Suplee, 2005; Suplee et al., 2007). Existing reference sites are revisited over time to grow datasets, are sampled systematically to allow for long-term trend analysis, and new reference sites are identified on an ad hoc/as-needed basis. Reference sites are grouped by ecoregion and are sampled on a rotational basis. Generally, 23-24 sites are visited per year, alternating between eastern and western ecoregions, such that each ecoregion is sampled every four years. Reference sites were first monitored in 1992 and sampling has occurred almost every year since 2000. The same suite of physical, chemical, and biological parameters is collected at each site.

Commented [LT24]: Please describe what data are collected and how those data are being analyzed to evaluate current reference condition. It seems like a lot of sampling occurs but its unclear how the data are used.

Also, isn't it time to move to other waterbody types? Wetlands? Lakes?

Water Resource Type(s): Rivers/Streams

4.3 OBJECTIVE 2 - EVALUATE AND DESCRIBE WATER QUALITY CONDITIONS

Beneficial Use Assessment (BUA)

Description: DEQ assesses whether state surface waters attain water quality standards and support designated beneficial uses: drinking, culinary, and food processing (after treatment); bathing, swimming, and recreation; growth and propagation of fishes (either salmonid or non-salmonid) and associated aquatic life, waterfowl and furbearers; agricultural water supply; and industrial water supply (75-5-702, MCA; 33 U. S. Code § 1251). Waters that do not attain water quality standards are added to Montana’s list of impaired waters which DEQ submits biennially to EPA with other water quality status and trend information in Montana’s Water Quality Integrated Report (WQIR).

Monitoring Approach: To assess water quality and identify impaired waters, DEQ conducts targeted monitoring to meet data requirements specified in Montana’s beneficial use assessment method (Makarowski, 2020a) and other parameter-specific assessment methods, and also compiles existing and readily available data. DEQ’s preferred approach is to select watersheds in coordination with the TMDL program and to follow the water quality planning process (Section 3.1), apply a holistic watershed approach (Section 3.2) and use watershed risk assessment (Section 3.3) to define the assessment scope based on high priority waters, water quality issues and sources. Alternately, assessment projects may focus narrowly on individual waterbodies, for example, in response to stakeholder requests for

assessment or to reassess waters where conditions are thought to have changed due to emerging problems or restoration activities.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs

Commented [LT25]: This avoids the big issue of the lack of AMs. Seems that should be noted.

Watershed Characterization Monitoring

Description: Watershed characterization monitoring is a short-term, intensive investigation to characterize water quality across a watershed. Watershed characterization monitoring may be implemented in watersheds prior to assessment and TMDL development activities. This sampling allows DEQ to make watershed-scale generalizations about water quality conditions, detect spatial patterns, and can provide data used during watershed risk assessment, assessment, and TMDL development.

Monitoring Approach: DEQ uses a synoptic study design in which representative sites are selected on the mainstem river and near the mouths of major tributaries and are all sampled within a short period of time (e.g., a week) for a comprehensive suite of analytes. Sampling events strategically represent different hydrologic and seasonal conditions (e.g., runoff, baseflow) to enable comparisons and detection of spatial and temporal patterns. This analytical suite is also used to screen for potential pollutants in advance of targeted monitoring for beneficial use assessment purposes.

Commented [LT26]: What about the NRSA design? Is this design appropriate for a watershed or perhaps more of an AU assessment?

Water Resource Type(s): Rivers/Streams

Wetland Monitoring

Description: DEQ's Wetland Program provides state leadership to conserve and protect wetlands for their water quality, water quantity, habitat, and other environmental benefits. DEQ recognizes that properly functioning wetlands also support many of the designated beneficial uses of other surface waters. DEQ's Wetland Program chairs the [[HYPERLINK](http://montanawetlandcouncil.pbworks.com/w/page/132750144/Montana%20Wetland%20Council) "http://montanawetlandcouncil.pbworks.com/w/page/132750144/Montana%20Wetland%20Council"] which implements Montana's Wetland Strategic Framework, *Priceless Resources, A Strategic Framework for Wetland and Riparian Area Conservation and Restoration in Montana* (Montana Wetland Council, 2013).

Monitoring Approach: DEQ's Wetland Program monitors wetlands to characterize their condition (i.e., ecological integrity) at a watershed scale, and evaluates how stressors in and around wetlands affect their chemical, physical and biological condition. DEQ then relates wetland condition to the loss or gain of ecological functions (such as flood control, flood abatement, and nutrient attenuation), and recommends best management practices to protect and restore these ecological functions.

DEQ partners with others in the Montana Wetland Council to develop and implement Montana's Wetland Strategic Framework (Montana Wetland Council, 2013, and future revisions) which includes a Monitoring and Assessment strategic direction to encourage collection, integration, and use of monitoring and assessment data to inform local planning, protection, restoration, and landscape-level decision-making. DEQ also partners with stakeholders to establish ecological monitoring at some wetland restoration sites to understand the effects of restoration activities on water quality and other aquatic resources.

Commented [LT27]: Is there a link to this document?

Water Resource Type(s): Wetlands

National Aquatic Resource Surveys (NARS)

Description: The [[HYPERLINK "https://www.epa.gov/national-aquatic-resource-surveys/nrsa"](https://www.epa.gov/national-aquatic-resource-surveys/nrsa)] are collaborative programs between EPA, states, and tribes designed to assess the quality of the nation's waters. The three NARS surveys relevant in Montana are the National Rivers and Streams Assessment (NRSA), the National Lakes Assessment (NLA), and the National Wetland Condition Assessment (NWCA).

Monitoring Approach: NARS use a probabilistic survey design in which sites are randomly selected and the same suite of chemical, biological, physical habitat and human health indicators are sampled or measured at each site. DEQ does not directly participate directly in NARS monitoring; EPA conducts the monitoring for NRSA and NLA, and DEQ contracts monitoring for the NWCA. DEQ uses funds from EPA to statistically analyze water quality data collected under the NARS in Montana and to develop a report summarizing the data and findings for each of the three surveys every five years (typically via contract). To the extent possible, the data is used to evaluate overall water quality status and trends.

The most recent Montana Lake Assessment report was conducted using 2012 NLA data, with subsequent reports for 2017, then 2022 and 2027. The upcoming Montana Rivers and Streams report will be developed using 2013-2014 NRSA data, with subsequent reports for 2018-19 and then 2023-24, then 2028-29. The upcoming NWCA is to be completed in 2021, then 2026.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs; Wetlands

Biological Assessments

Description: Biological assessments directly measure effects of pollutants on aquatic communities but are typically unable to distinguish a specific cause of impairment; rather, they represent the biological response to cumulative effects of past or current impacts from multiple stressors (EPA, 2002). Biological assessments typically quantify the difference between reference or expected conditions of aquatic communities and those found at the site being evaluated (EPA, 2002). EPA recommends that states include biological indicators among the core indicators used to assess attainment with aquatic life-based water quality standards (EPA, 2002).

Monitoring Approach: To help evaluate biological integrity of state waters and inform aquatic life beneficial use assessment determinations, DEQ evaluates biological data using metrics that reflect whether biological communities are intact and functional. DEQ considers available biological data when determining full support of aquatic life use but does not list or delist waterbody-pollutant impairments based solely on biological data. Some of DEQ's pollutant-specific assessment methods incorporate specific biological metrics into the decision frameworks for water quality impairment listing decisions. DEQ's biological assessments have long focused on periphyton and macroinvertebrate communities in which DEQ collects samples for taxonomic identification, then compares biological metrics against thresholds to evaluate biological integrity at sample sites (e.g., observed versus expected conditions).

Commented [LT28]: While this sounds good, it isn't happening. So what is the plan to do this.

Commented [LT29]: Not in align with EPA's 303(d) policy.

Other uses of biological data collected by DEQ and others include monitoring benthic algal biomass during investigations of nuisance algae blooms, monitoring harmful algal blooms (HABs) (**Section 4.4**), incorporating fish and/or macroinvertebrate tissue into bioaccumulative pollutant analyses (e.g., PCBs, PFAS, mercury, selenium), and incorporating biological assessments into wetland condition assessments.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs; Wetlands

4.4 OBJECTIVE 3 - INVESTIGATE WATER QUALITY PROBLEMS AND EMERGING CONCERNS

Harmful Algal Blooms (HABs)

Description: Harmful algal blooms (HABs) are rapid overgrowths of cyanobacteria on waterbody surfaces which may produce toxins and can pose serious health risk to humans and animals. HABs are increasingly common in Montana. DEQ partners with Montana's Department of Public Health and Human Services (DPHHS) and Department of Fish, Wildlife and Parks (FWP) to form the State HAB Team.

Monitoring Approach: The State HAB Team provides educational materials and an [[HYPERLINK "file:///C:/DEQWQ001/WQ/WQP/7_QAProgram/Katie/MonitoringStrategy/HAB.mt.gov"](file:///C:/DEQWQ001/WQ/WQP/7_QAProgram/Katie/MonitoringStrategy/HAB.mt.gov)] where the public can report and view suspected HABs. When people report suspected HABs with photos, the State HAB Team visually verifies the HAB and can provide monitoring resources and outreach guidance to a local managing jurisdiction. Positive visual identification of a HAB prompts a caution advisory on the report map, and the State HAB Team recommends the local managing jurisdiction post caution signage. If cyanotoxins are identified based on further monitoring results, additional advisories and outreach would be recommended. The HAB Guidance Document for Montana (DEQ, DPHHS, and FWP, 2019) provides more information about monitoring approaches and public outreach.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs; Wetlands

Per- and Polyfluoroalkyl Substances (PFAS)

Description: Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that have been used since the 1940s to produce a wide variety of industrial and consumer products (ITRC, 2018a). Since 2000, the US has been phasing out the use of these chemicals because of health impact concerns. PFAS are extremely persistent, bioaccumulative, and highly soluble and mobile and can be transported long distances (ITRC, 2018a). Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) are the two most commonly studied PFAS. In 2016, EPA adopted a lifetime drinking water health advisory of 70 ng/L (or ppt) for the sum of PFOS and PFOA (EPA, 2016a; 2016b) and DEQ added numeric PFOS and PFOA criteria for groundwater at the EPA Health Advisory level of 70 ppt, individually or combined (DEQ, 2019d). DEQ and partners, including Montana Fish, Wildlife and Parks, Montana Department of Agriculture, Montana Department of Health and Human Services, and Lewis and Clark County Public Health, developed a [[HYPERLINK "https://deq.mt.gov/DEQAdmin/PFAS"](https://deq.mt.gov/DEQAdmin/PFAS)] (DEQ, DPHHS, FWP, Dept. of Ag, and Lewis and Clark Public Health, 2020) to address PFAS impacts across the state.

Monitoring Approach: An element of the Montana PFAS Action Plan is the development of multi-faceted monitoring program, including standard operating procedures (SOPs) for sampling different media, to better identify PFAS identify and inventory known and potential PFAS sources and sites across the state. DEQ maps potential and confirmed PFAS contamination sites and potential sources and uses risk-based monitoring designs to screen for detectable PFAS concentrations in various sample media including surface water, benthic sediment, soils, groundwater, and drinking water. Monitoring findings will be shared with the public. Drinking water samples will be compared against human health criteria. DEQ will partner with other entities to conduct additional PFAS monitoring, such as the Dept. of Ag. (groundwater) and FWP (fish tissue).

Commented [LT30]: What is the state's plan to list for PFAS?

Water Resource Type(s): Rivers/streams; Lakes/Reservoirs; Groundwater; Drinking Water

Emergency Response

Description: Events that result in environmental impacts such as spills, leaks, or natural disasters may require emergency response by DEQ or inter-agency response teams. DEQ participates in the State Incident Command System within the Montana Emergency Response Framework when responding to environmental emergencies.

Monitoring Approach: DEQ participates in short-term and long-term monitoring and clean-up activities associated with environmental emergency response as needed.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs; Wetlands; Groundwater; Drinking Water

Other Emerging Concerns

Description: Contaminants of emerging concern are pollutants that have been detected in waterbodies and may cause ecological or human health impacts but are not regulated under current environmental laws.

Monitoring Approach: DEQ may study contaminants of emerging concern, as resources allow, when they are detected in Montana's waters, when new sources are identified, when scientific understanding grows about their environmental and public health impacts, or if federal water quality criteria is proposed. For example, DEQ may conduct research projects to test hypotheses regarding harm to beneficial uses or to develop water quality standards or may perform screening-level monitoring to understand the presence, extent, and probable sources of these substances in Montana's waters.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs; Wetlands; Groundwater; Drinking Water

4.5 OBJECTIVE 4 – IMPLEMENT WATER QUALITY MANAGEMENT PLANS AND CONTROL PROGRAMS

TMDL Development and Source Assessment

Description: DEQ's Watershed Protection Section selects TMDL priority areas in consultation with the Statewide TMDL Advisory Group (STAG) (75-5-702, MCA). TMDL development involves: 1) calculating the maximum amount of a pollutant a waterbody can receive from all sources and still meet water quality standards, 2) comparing the TMDL to the existing load that the waterbody is currently receiving from all sources, 3) allocating the TMDL among all significant contributing sources (i.e., wasteload allocations for point sources and load allocations for nonpoint sources), and 4) determining for each source the amount of pollution reduction needed to achieve water quality standards.

Monitoring Approach: When developing TMDLs, DEQ typically uses data collected during beneficial use assessment or other available data from previous monitoring activities. However, DEQ often conducts additional targeted monitoring to confirm and quantify pollutant sources for use in determining source allocations and reductions. Examples of source assessment monitoring include bank measurements for calculating bank erosion hazard index, riparian greenline monitoring, road runoff assessment, shade model inputs, septic modeling, etc. DEQ also includes monitoring recommendations in each TMDL document to guide future data collections by DEQ or stakeholders.

Commented [LT31]: This is pretty generic. What are the TMDL priorities for the next 10 years? Vision areas?

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs

Potential Projects Mapping

Description Under state law, DEQ is charged with informing Montana citizens about voluntary land, soil and water conservation practices that can be implemented to address pollutant loads identified in TMDLs. DEQ is developing and testing a method called Potential Projects Mapping Method (PM2) for identifying and mapping sites where conservation practices may need to be implemented to meet water quality standards.

Monitoring Approach: PM2 is primarily a GIS-based mapping tool, though ground-truthing may be incorporated to improve accuracy. PM2 relies heavily on skilled photo interpretation, but also makes use of other available Geographic Information System (GIS) data including LIDAR, USGS topographic maps, wetland maps, and the National Hydrography Dataset (NHD). Map products from PM2 may be provided to local conservation organizations and partner agencies to assist them with specific planning needs. The accuracy and completeness of PM2 data is largely dependent on the skill and expertise of the individuals employing the method and the quality of the existing GIS data available for a particular location at a particular time. This may limit repeatability, and limit comparison between different watersheds or different years.

Commented [LT32]: Is this monitoring? Or a GIS analysis?

Water Resource Type(s): Rivers/Streams Lakes/Reservoirs

Regional or Cross-Boundary Initiatives

Description: Water quality issues that span political boundaries or across major basins beyond Montana's borders require DEQ's participation in agreements and partnerships with other states, tribes, countries, or collaborative groups working to research and address these issues.

Monitoring Approach: DEQ participates on technical committees and councils to plan and coordinate cross-boundary projects. Mechanisms include monitoring, cost-sharing, and data-sharing agreements.

Commented [LT33]: Shouldn't this list several examples?

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs; Groundwater

MPDES Permit Development and Renewal

Description: During MPDES permit development or renewal, DEQ uses ambient data collected from the receiving water upstream from the facility's point of discharge when determining the assimilative capacity of a receiving water and evaluating reasonable potential that a discharger could exceed a water quality standard; permit limits are informed by this evaluation. DEQ also uses upstream ambient data to calculate the water quality standards for certain metals (based on ambient hardness) and ammonia (based on ambient pH and temperature).

Monitoring Approach: DEQ compiles available upstream ambient data from the Water Quality Portal or other known data sources. If upstream ambient data does not already exist, DEQ may require a permittee to collect it as part of the monitoring requirements specified in a permit. If ambient monitoring data is required by the MPDES permit, the permittee is required to submit this data electronically with NetDMR.

Commented [LT34]: This should be updated to reflect the state's AMP needs for nutrients. If any.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs

Source Water Protection Program (SWPP)

Description: DEQ's Source Water Protection Program (SWPP) develops source water delineation and assessment reports (SWDARs) which involves mapping and inventorying sources of contaminants and evaluating susceptibility to contamination for source water protection areas (i.e., areas that contribute water to aquifers or surface waters used for drinking). Communities (e.g., sanitarians, water and wastewater operators, health officials, planners, conservation professionals, and others) develop and implement source water protection plans based on these reports.

SWPP reviews source water components of PWS-6 reports for new proposed wells for community or non-community non-transient public water supplies and either recommends approval or provides feedback on what would be necessary to gain a recommendation of approval for a new well location.

SWPP also conducts potential contaminant source (PCS) reviews when a Categorical Exclusion (CatEx) is used for rehabilitation or replacement of existing, or installation of new, water and sewer mains during an environmental assessment (EA) for water and wastewater infrastructure projects. A memo and map detailing if and where there are PCS in the project boundary is created and provided to DEQ's review engineer for the project.

Monitoring Approach: SWPP uses monitoring and geospatial data from many DEQ programs (e.g., remediation, underground storage and leaking underground storage tanks, hazardous waste, asbestos control, Superfund, public water supply) and other programs (e.g., Montana Bureau of Mines and Geology (MBMG), Department of Agriculture) to create SWDARs, review PWS-6 reports, and during CatEx review.

Water Resource Type(s): Groundwater; Drinking Water

401 Water Quality Certifications

Description: Under Section 401 of the Clean Water Act (CWA), a federal agency may not issue a permit or license for an activity that may result in a discharge into a water of the United States unless a Section 401 water quality certification (or waiver) is issued. States and tribes where the discharge would originate are responsible for issuing water quality certifications. Major licenses and permits subject to 401 include: 1) Clean Water Act Section 404 permits (describe), and 2) Federal Energy Regulatory Commission (FERC) licenses for hydropower facilities and natural gas pipelines.

Monitoring Approach: DEQ generally does not require monitoring for Section 404 permits but does require monitoring for FERC licensing, with DEQ input and methods incorporated into sampling plans. Facilities with FERC licenses develop water quality monitoring programs to evaluate the impacts of facility operation on water quality and aquatic species. For example, NorthWestern Energy developed a water quality and biological monitoring program for their nine dams on the Missouri and Madison Rivers (FERC license 2188) to identify long-term trends and spatial variation of water quality and biological parameters and to evaluate the effects of operation and maintenance of the hydroelectric facilities on these rivers. NorthWestern Energy similarly develops sampling plans for their Thompson Falls facility (FERC No. 1869). DEQ provides input, procedures and quality control oversight for monitoring plans.

Commented [LT35]: Good example. Other similar examples should be provided for other sections.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs; Wetlands

4.6 OBJECTIVE 5 - TRACK WATER QUALITY CHANGE OVER TIME

Trend Monitoring

Description: DEQ supports long-term trend monitoring networks in Montana, particularly on large rivers. Because they are resource intensive, implementation of long-term monitoring networks is often dependent on partnerships with local stakeholders to help collect samples, analyze data and write reports.

Monitoring Approach: Fixed station monitoring networks often include routine water quality sampling at fixed locations on large river mainstems and periodic synoptic sampling near the mouth of their tributaries. DEQ aims to establish long-term monitoring networks, as resources allow, and coordinate with local monitoring partners wherever possible to gain travel and staffing efficiencies. For example, DEQ is a member of the Clark Fork River Water Quality Monitoring Committee (CFRWQMC) with the Idaho DEQ, Avista Corporation, and the University of Montana, and contracts with the Clark Fork Coalition for monitoring program management. DEQ funds nutrient and algae trend monitoring and reporting (every five years) and provides quality system oversight.

Commented [LT36]: What about other basins? Seems like time to move beyond the Clark Fork?

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs

4.7 OBJECTIVE 6 - EVALUATE EFFECTIVENESS OF POLLUTION CONTROL PROGRAMS

Nonpoint Source Focus Watersheds

Description: A key strategy of DEQ's Nonpoint Source (NPS) Program is to identify focus watersheds where a majority of NPS staff and funding resources will be applied over a given period (e.g., 3 years) to influence significant and measurable progress toward reducing NPS pollution. NPS focus watersheds are often 4th level Hydrologic Unit Code (HUC) in size and have one or more DEQ-accepted Watershed Restoration Plan (WRP) in place, have existing resources and momentum for water quality improvements through active watershed groups or other entities, and have stakeholder support for improving water quality (among other selection criteria) (DEQ, 2019c). It is expected that at least 25% to 50% of the yearly Section 319 funding will be reserved for each focus watershed for at least two 319 annual funding cycles. While focused on addressing impaired surface waters, the NPS program also strives to identify protection approaches for existing high-quality waters and other key water-related resources such as wetlands, groundwater, or source water protection areas.

Monitoring Approach: Monitoring to demonstrate progress toward achieving water quality goals is a key component of focus watersheds. DEQ develops targeted monitoring designs aimed at collecting baseline data and making comparisons to track change over time and linking water quality change to actions or projects (DEQ, 2019a). Other monitoring approaches likely include TMDL Implementation Evaluations (TIEs) and Project Effectiveness Reviews (PERs) (Section 4.7). Monitoring partnerships and volunteer monitoring are often supported in focus watersheds. When substantial improvement activities have been implemented and recovery time has passed, DEQ also collects data to reassess waterbodies (Section 4.3) to determine whether they can be removed from the list of impaired waters because water quality standards have been attained.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs; Wetlands

National Water Quality Initiative (NWQI)

Description: The [[HYPERLINK](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/water/?cid=stelprdb1047761)

"<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/water/?cid=stelprdb1047761>"] is a partnership among the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the U.S. Environmental Protection Agency, and state water quality agencies. Through NWQI, NRCS and partners work with agricultural producers to implement voluntary conservation practices to reduce pollutant loads of sediment, nutrients and pathogens and improve water quality in high-priority watersheds while maintaining agricultural productivity (NRCS, 2017). NRCS provides targeted funding and technical assistance, and state water quality agencies and other partners contribute additional resources for watershed planning, implementation, outreach, and monitoring.

Monitoring Approach: DEQ participates in the selection of NWQI watersheds and monitors and reports water quality conditions through time. Monitoring for NWQI watersheds typically entails initial baseline monitoring to capture pre-restoration conditions, then periodic monitoring (e.g., 2-5 years) post-restoration to determine load reductions and evaluate the degree to which restoration projects effectively improved instream water quality.

Water Resource Type(s): Rivers/Streams

Nonpoint Source (319) Success Stories

Description: DEQ's NPS Program is required by EPA to document Section 319 nonpoint source pollution success stories to highlight where restoration efforts have resulted in water quality improvements in NPS-impaired water bodies. Success stories feature waters that are fully or partially restored, or that show progress toward water quality goals.

Monitoring Approach: DEQ's NPS Program identifies candidate success stories and partners with DEQ's Monitoring and Assessment program to develop and implement targeted monitoring designs to reassess whether one or more impairment cause can be removed from a waterbody (i.e., delisted) because water quality standards are met due to reductions in NPS pollution. The NPS Program submits a summary of the water quality improvements, partners, assessment outcomes and photos to EPA.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs

TMDL Implementation Evaluations (TIEs)

Description: TMDL Implementation Evaluations (TIEs) are formal evaluations of progress in restoring water quality and implementation of reasonable land, soil and water conservation practices, often at a watershed scale. The process involves evaluating what water quality improvement activities have been implemented, what opportunities for additional improvements remain, and whether existing data shows if water quality improvements are being realized.

Monitoring Approach: In addition to inventorying water quality improvement activities, TIEs may involve evaluating or collecting data that can indicate the degree to which progress has been made to achieve water quality standards. TIEs may identify opportunities for additional water quality improvement activities and can inform development or revision of Watershed Restoration Plans (WRPs) and TMDLs. When data shows evidence of cumulative water quality improvement resulting from restoration and protection projects, DEQ's Nonpoint Source Program may request that DEQ's

Monitoring and Assessment Section reassess a waterbody to determine if it is meeting water quality standards and supporting beneficial uses.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs

319 Project Effectiveness and Load Reduction Monitoring

Description: Through the [[HYPERLINK "http://deq.mt.gov/Water/SurfaceWater/NonpointSources"](http://deq.mt.gov/Water/SurfaceWater/NonpointSources)], DEQ provides funds to local watershed groups, conservation districts, educational institutions, and government entities to design and implement on-the-ground projects that reduce and prevent nonpoint source pollution. Contracts are developed for projects that are awarded funding.

Monitoring Approach: Most 319 projects that are awarded funding include a monitoring component to monitor the effectiveness of the project in reducing or preventing nonpoint source pollution. Monitoring may include metrics that confirm the project was successful as-built (e.g., plant survival for revegetation projects). Monitoring also often aims to produce data that can be used to calculate or estimate nonpoint source pollutant load reductions. DEQ developed a Load Reduction Estimation Guide (DEQ, 2016a) to guide these monitoring and analysis efforts.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs

Project Evaluation Reviews (PERs)

Description: Section 319 grant contracts typically run for 3 years and include funds to monitor project effectiveness. Common approaches include vegetation mortality monitoring, photopoint monitoring, and load reduction estimates. After this contract window, contractors are not required by DEQ and often do not have resources to conduct longer term monitoring. To accomplish longer term monitoring, nonpoint source program staff use Project Effectiveness Reviews (PERs) to evaluate how effective Section 319 projects are at continuing to achieve goals long term. These qualitative reviews provide the opportunity to gather lessons learned, engage with local watershed groups, identify maintenance needs, and learn from landowners about the economic and social benefits that Section 319 projects may provide. The water quality benefits evaluated at the project scale can inform stream and watershed scale projects such as success stories and TIEs.

Monitoring Approach: A PER should be conducted approximately every 5 years after the project's completion. Before visiting a project site, NPS program staff use information from the contract file to begin populating the PER form and compiling information including: the projects' goals, best management practices (BMP) implemented, BMP locations, maps and photopoints. At the project site, staff (and ideally the original project sponsor) fill out the PER Activity Review form (BMP-scale), Project Overview form (project-scale), Landowner Survey forms if the landowner is available, and recapture photopoints. PER data are tracked in an online webservice and can be summarized to support lessons learned, successful approaches, landowner achievements, or TIE conclusions.

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs

MPDES Effluent Monitoring

Description: Entities that discharge water to a state surface water must obtain a [[HYPERLINK "https://deq.mt.gov/Water/permits/Discharges"](https://deq.mt.gov/Water/permits/Discharges)] permit from DEQ (individual or general, depending on

the type of discharge). MPDES permits regulate wastewater discharges by limiting the quantities of pollutants to be discharged.

Monitoring Approach: Discharge effluent monitoring is conducted by permittees in accordance with the terms of their MPDES permits. Permits specify the parameters, locations and frequency (e.g., daily, weekly, monthly, quarterly, annually) that data must be collected. Permittees are required to submit Discharge Monitoring Results electronically with NetDMR. This data is primarily used to evaluate compliance with discharge limits specified in the permit.

Commented [LT37]: How is this different than the previous language on permitting -related monitoring?

Water Resource Type(s): Rivers/Streams; Lakes/Reservoirs

Groundwater Permit Compliance Monitoring

Description: Under the Montana Water Quality Act (§75-5-605), the [[HYPERLINK "https://deq.mt.gov/water/drinkingwater/groundwater"](https://deq.mt.gov/water/drinkingwater/groundwater)] (MGWPCS) program issues groundwater discharge permits to owners of potential sources of pollution to state groundwater to prevent violations of ground water standards or degradation of high quality ground waters. Typical permitted facilities include residential wastewater treatment systems, metal ore mills, lumber mills, wood product manufacturers, breweries, and community water treatment plants.

Monitoring Approach: Groundwater permits contain monitoring requirements aimed at characterizing the aquifer receiving the discharge and the quality of the permittee's discharge. Data collected by permittees, as well as other available data for the receiving aquifer, is used when developing discharge limits and evaluating compliance. Required analytes represent parameters of interest or concern based on project- and aquifer-specific characteristics.

Commented [LT38]: Please describe how MDEQ is evaluating GW to SW connections?

Water Resource Type(s): Groundwater

4.8 OBJECTIVE 7 - PROTECT PUBLIC HEALTH

Public Water Supply Monitoring

Description: Under the Safe Drinking Water Act (SDWA), EPA sets legal limits on over 90 contaminants in drinking water which reflect the levels that protects human health and that water systems can achieve using the best available technology. DEQ's [[HYPERLINK "http://deq.mt.gov/Water/DrinkingWater/Monitoring"](http://deq.mt.gov/Water/DrinkingWater/Monitoring)] (PWS) program sets additional drinking water protections.

Monitoring Approach: EPA's drinking water rules specify the monitoring schedules and methods that water systems must follow for each regulated contaminant. DEQ sets additional monitoring requirements. The [[HYPERLINK "http://deqrpts.deq.mt.gov/reports/rwservlet?PWS&DESFORMAT=PDF&report=COMPMONTR_ITSD.rep¶mform=yes"](http://deqrpts.deq.mt.gov/reports/rwservlet?PWS&DESFORMAT=PDF&report=COMPMONTR_ITSD.rep¶mform=yes)] informs public water system operators, owners, and administrators on what they must sample for, the required number of samples to be taken, where and when samples are to be taken, correct label information for the sample bottles and forms, and whether the system has met the current requirement. Community water systems are required to submit monitoring data to the state, distribute an annual Consumer Confidence Report (CCR) that summarizes information about water source, monitoring results, compliance, health effects, and educational information, and must adhere to public notification requirements when water quality is compromised. Data is also used to

determine which systems are in compliance with monitoring requirements and maximum contaminant levels (MCLs).

Commented [LT39]: Aren't DW operators doing this monitoring? IF MDEQ isn't doing it, we probably should delete this section. The focus is on work MDEQ does and/or guides.

Water Resource Type(s): Drinking Water

Lead in Schools Drinking Water Program

Description: Montana Department of Public Health and Human Services (DPHHS) has rolled out a Lead Reduction in Schools Drinking Water Rule (ARM 37.111.832(8)) to protect school children by minimizing lead levels in drinking water provided at Montana's schools. Schools (as defined in 20-5-102(2)(e), MCA) are required to sample for lead in their drinking water.

Monitoring Approach: DEQ used an EPA grant to set up a [[HYPERLINK](#) "file:///G:/WQP/7_QAProgram/Katie/MonitoringStrategy/http://deq.mt.gov/Water/DrinkingWater/LeadInSchools/LISAdmin"/"intro"] reimbursement program to help public schools cover the laboratory costs of sampling for lead in their drinking water and provides sampling training and guidance materials. DEQ is also working with the Montana Office of Public Instruction and seeking funds to develop a grant program to assist schools with remediation costs if lead is found above action levels.

Water Resource Type(s): Drinking Water

4.9 KEY MONITORING EFFORTS BY PARTNERS

Commented [LT40]: Great section! Very informative. Appreciate the links.

Several of DEQ's partner agencies and organizations administer monitoring programs which produce quality data that is used by the collecting entity, DEQ and other data users to achieve water quality objectives. Several key efforts include:

The United States Geological Survey (USGS) operates a [[HYPERLINK](#) "https://waterdata.usgs.gov/mt/nwis/"] across the US and Montana which collect streamflow, water-level, and/or water quality data which is available in near real-time online. The streamgages are primarily operated and maintained by the USGS, but most are funded in partnership with one or more public or private agencies or organizations.

Montana Department of Natural Resources and Conservation (DNRC) operates a Surface Water Assessment and Monitoring Program (SWAMP) which consists of a network of real-time streamgages across Montana. Surface water collected by DNRC (real-time and manually downloaded gages) and MBMG are available for display and download from the [[HYPERLINK](#) "https://mbmg.mtech.edu/mapper/mapper.asp"].

The Montana Bureau of Mines and Geology (MBMG) has a [[HYPERLINK](#) "https://mbmg.mtech.edu/WaterEnvironment/GWAP/main.asp"] to "Visit the Groundwater Monitoring section of the MBMG website"] to systematically track long-term water-level and water-quality changes in Montana's major aquifers. The more than 800-well network of strategically located wells across the State produces groundwater-level records that directly measure how Montana's aquifers respond to seasonal, climatic, developmental, or land-use factors.

MBMG's [[HYPERLINK](#) "https://mbmg.mtech.edu/WaterEnvironment/GWIP/main.asp"] conducts research to answer specific hydrogeologic issues that are ranked as the most urgent within the state by the Montana Ground Water Steering Committee. MBMG produces models and reports and makes data

available through the [HYPERLINK "<https://mbmgwic.mtech.edu/>"] o "Visit the Ground Water Information Center website"] (GWIC).

Montana Department of Fish, Wildlife & Parks (FWP) partners with the Department of Health and Human Services and DEQ to provide [HYPERLINK "<https://fwp.mt.gov/binaries/content/assets/fwpp/fish/montanasportfishconsumptionguidelines.pdf>"]. These guidelines provide recommendations on the amount and type of sport fish to eat, based on fish size and measured concentrations of contaminants found in the fish. FWP collects fish tissue samples that are analyzed for select contaminants.

The United States Forest Service (USFS) [HYPERLINK "https://www.fs.fed.us/biology/resources/pubs/feu/pibo/pibo-2011-EM_Stream_Sampling_Protocol.pdf"] Effectiveness Monitoring Program was initiated in 1998 to provide a consistent framework for monitoring aquatic and riparian resources on USFS and Bureau of Land Management (BLM) land within the Upper Columbia River Basin. The primary objective is to determine whether priority biological and physical attributes, processes, and functions of riparian and aquatic systems are being degraded, maintained, or restored.

The [HYPERLINK "<http://mtnhp.org/wetlands/default.asp>"] has a wetland mapping program that creates a statewide digital wetland and riparian layer as a resource for management, planning, and restoration efforts.

The Ecological Mapping, Monitoring and Assessment group at the University of Montana [HYPERLINK "<https://www.umt.edu/crmw/Mission/default.php>"] conducts wetland monitoring (e.g., for the National Wetland Condition Assessment and Bureau of Land Management (BLM) Aquatic Assessment, Inventory, and Monitoring strategy).

[HYPERLINK "<https://agr.mt.gov/Groundwater>"] conducts groundwater monitoring for pesticides and nitrates to determine presence and effect of agricultural chemicals on groundwater.

Montana Department of Fish, Wildlife & Parks administers a program to [HYPERLINK "<https://cleandraindry.mt.gov/Aquatic-Invasive-Species>"] from aquatic invasive species. Montana's Aquatic Invasive Species (AIS) Early Detection and Monitoring Program allows FWP biologists to locate small or source AIS populations, and to study existing population trends and investigate suspect findings.

Bureau of Land Management conducts [HYPERLINK "<https://www.blm.gov/documents/national-office/blm-library/technical-reference/riparian-area-management>"] (PFC) assessments for lotic and lentic areas to inform and evaluate riparian management practices. The BLM also implements a [HYPERLINK "<https://www.blm.gov/documents/national-office/blm-library/technical-reference/multiple-indicator-monitoring-mim-stream>"] protocol to monitor impacts of livestock grazing management and other activities on stream channels and streamside vegetation.

5.0 CORE AND SUPPLEMENTAL WATER QUALITY INDICATORS

Commented [LT41]: This warrants a discussion of next steps/ gaps.

DEQ uses a tiered approach to selecting parameters when developing monitoring designs (Makarowski, 2020a). Core parameters are especially closely linked to beneficial use support, often have numeric water quality standards, and tend to represent Montana's most prolific causes and sources of water

quality impairment. DEQ typically prioritizes development of parameter-specific assessment methods for core parameters and assesses core parameters when assessing all beneficial uses on an assessment unit. Core parameters may be supplemented with additional parameters as resources allow or when data is readily available. Supplemental parameters can also impact beneficial uses but impacts may be indirect or sources may be less prevalent.

Table 2 presents suggested core and supplemental parameters for each beneficial use. However, determining which parameters should be assessed, and considered core versus supplemental, for an assessment unit depends on a variety of factors and should be decided on a case-by-case basis. The outcome of watershed risk assessment (**Section 3.3**) can play an important role in identifying core and supplemental parameters.

Table 2. Core and secondary assessment parameters for beneficial use assessment.

Beneficial Use	Suggested Assessment Parameters		Limitations/Considerations/Guidance
Aquatic Life and Fish	Core Parameters	Nutrients	Assessment method for Wadeable streams (Suplee and Sada, 2016).
		Parameters with numeric aquatic life standards (e.g., metals)	Assessment method for metals (Drygas, 2012)
		Sediment	Assessment method for Wadeable streams in mountain/transitional areas (Kusnierz, et al., 2013)
		Temperature	No assessment method
		Dissolved oxygen (DO)	No assessment method
		Biological communities	Biological metrics apply for some pollutant specific assessment methods
	Supplemental Parameters	Habitat	No assessment method
		Electrical conductivity (EC)	No assessment method
		Sulfate	No assessment method
		Turbidity/TSS	No assessment method
		pH	No assessment method
		Flow alterations	No assessment method
Recreation	Core Parameters	<i>Escherichia coli</i> (<i>E. coli</i>)	<i>E. coli</i> assessment method (Makarowski, 2020b)
		Nutrients (mountain/transitional streams only)	Assessment method for Wadeable streams (Suplee and Sada, 2016)
	Supplemental Parameters	Harmful algal blooms (HABs)	No assessment method; no numeric standards
		Oil & Grease	No assessment method
		Aesthetics/Odor	No assessment method

Commented [LT42]: I like the table b/c it highlights the gap between data collected and what is assessed. The strategy should highlight the plan to address these gaps.

Commented [LT43]: Update.

Commented [LT44]: If biology is a core parameter, please indicate what MDEQ's plans are to use those data regularly

Commented [LT45]: Is this accurate?

Beneficial Use	Suggested Assessment Parameters		Limitations/Considerations/Guidance
Drinking Water (Human Health)	Core Parameters	Parameters with numeric human health standards (e.g., metals)	Assessment method for metals only (Drygas, 2012)
		<i>Escherichia coli</i> (<i>E. coli</i>) (A-1 and A-closed only)	<i>E. coli</i> assessment method (Makarowski, 2020b). Applies to A-1 and A-closed use classes only
Agriculture	Core Parameters	Electrical conductivity (EC) and Sodium Adsorption Ratio (SAR) for Rosebud Creek, Tongue River, Powder River, Little Powder River, and Tongue River Reservoir	Assessment method applies to select waterbodies with numeric standards (Bell, <i>et al.</i> , 2020)
		Electrical conductivity (EC) and Sodium adsorption ratio (SAR)	No assessment method in areas without numeric standards.
	Supplemental Parameters	Harmful algal blooms (HABs)	No assessment method; no numeric standards

Commented [LT46]: What about TDS? Metals?

6.0 QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance (QA) and quality control (QC) is the overall system of technical activities that measure the attributes and performance of a process, item, or service against a defined standard to verify that it meets the stated requirements, and activities that are used to fulfill quality requirements.

6.1 QUALITY MANAGEMENT PLAN (QMP)

DEQ's quality system is documented in the agency's Quality Management Plan (QMP) (DEQ, 2019d). The QMP describes DEQ's quality system policies and management guidelines, and includes QA goals, policies, procedures, organizational responsibilities, evaluation and reporting requirements, etc. The plan is valid for five years upon signature (most recently in 2019).

The goal of DEQ's quality system is to ensure that all environmental programs that acquire, generate, compile, or use environmental data and technology produce scientifically defensible, quality data that meets the informational needs and regulatory functions of the agency. The intent is to ensure data integrity (data is of known and documented quality), to provide consistency in business processes, efficiently use available resource, and to continually improve operations. Five principal elements describe the foundation of DEQ's quality system (DEQ, 2019d):

1. **Project Management:** Review proposed projects for waste and continuous process improvement to streamline inefficient work processes using the Lean methodology.
2. **Internal Control System:** Maintain a centralized location for policies and procedures and ensure they are documented, monitored, reviewed, and enforced.
3. **Quality Management Plan:** Describes how the agency structures its quality system and its quality policies and procedures and assesses the effectiveness of the quality system.
4. **System (Risk) Assessment:** Gages the quality of internal controls over time and adjust as necessary; allows managers to determine potential response actions for managing risk and correcting identified deficiencies.

5. **System Support:** Addresses the agency's computer hardware and software and focuses on data systems and application management to ensure for continuity, maintenance, and support.

6.2 QUALITY ASSURANCE DOCUMENTATION: QAPPS, SAPs, SOPs

QA/QC activities generally occur at the program level through the development, implementation, and review of quality assurance project plans (QAPPs), sampling and analysis plans (SAPs), and standard operating procedures (SOPs). These plans ensure the scientific validity of monitoring and laboratory activities and document the quality of the data that is produced so data users can verify whether it is appropriate for the specific uses (e.g., assessment and listing of impaired waters, TMDL development, project effectiveness, permit development, compliance). QA documentation also aims to minimize data loss due to out-of-control conditions or malfunctions.

DEQ develops QAPPs for many water monitoring programs and projects. These QAPPs contain elements required by EPA, including objectives, data quality objectives, sample design and methods, field and laboratory quality control requirements, data review, verification and validation, data management, data analysis and decisions, documentation, and assessment and response. DEQ has a Quality Assurance Project Plan (QAPP) for Sampling and Water Quality Assessment of Streams and Rivers in Montana (DEQ, 2005). This document specifies data quality objectives and field and laboratory quality control elements for beneficial use assessment projects. This document is planned for revision to reflect updated practices.

Any project that involves environmental data collections by or for DEQ's surface water quality programs must have a DEQ-approved SAP which details the sampling design, field methods, sampling schedule, sample handling, laboratory analytical requirements, instrument maintenance and calibration, field quality control measures, health and safety, and other monitoring-related elements.

Many of [[HYPERLINK "http://deq.mt.gov/Water/SurfaceWater/Monitoring"](http://deq.mt.gov/Water/SurfaceWater/Monitoring)] are documented in SOPs. SOPs are developed or revised as new or different monitoring protocols are applied.

DEQ uses a process of iterative review by technical staff and the division QA officer for QAPPs, SAPs and SOPs to ensure continuity among staff and consistent application of the QA system among business processes. The level of management required as approval signatories vary by document type. Final approved QAPPs and SAPs are archived by field season by the QA Officer and data managers.

6.3 TRAINING AND PERSONNEL QUALIFICATIONS

For environmental data collection activities that are conducted by or for DEQ, before monitoring commences, all field personnel conducting monitoring are required to receive training from experienced professionals. Participants are provided with a copy of project documents such as project plans, QAPPs, and SAPs. They are provided documentation of methods including SOPs and field forms and are required to review and adhere to the methods specified in project plans. Whenever feasible, experienced professionals accompany inexperienced staff during initial sampling events until each field personnel demonstrates proficiency. If mistakes are identified throughout the monitoring activities, efforts are made to provide supplemental training and clarify guidance documents to prevent further issues, and these corrective actions will be revisited during a lessons learned review period.

Commented [LT47]: Please indicate how frequently QAPPs are updated and confirm that SAPs are developed for any new projects or parameters before that work is initiated.

Also, please document MDEQ's internal QA process (briefly) or cite to an MDEQ document.

What about review of blanks/dupes? Who does that? How frequently? Where is it recorded?

Commented [LT48]: This is way outdated. We need it to be updated ASAP. Plans????

PFAS QAPP status? What about including a section above citing to the QAPP/SAPs for each monitoring approach with a date indicating when they were developed or a link to the document?

Also, are there any new parameters / projects sampled by MDEQ that need a SAP?

All drinking water treatment plants, wastewater treatment plants, or water distribution systems must be operated under the supervision of a fully certified operator to ensure the proper management, operation, and maintenance of the system. DEQ administers both the water and wastewater [[HYPERLINK "http://deq.mt.gov/Water/OpCert/Certification"](http://deq.mt.gov/Water/OpCert/Certification)] and provides testing and program information services to ensure comprehensive, ongoing training is provided to Montana's water and wastewater operator community.

Commented [LT49]: What about data collected for TMDLs or NPS activities? Do we need this level of detail?

6.4 LABORATORY QUALIFICATIONS

To ensure for data quality, all laboratories used by the agency must demonstrate and maintain a quality system. Laboratories must agree to meet any Water Quality Division project-specific QA requirements not included in the laboratory's QAPP. Laboratories must have periodic, independent assessments to document that it is adhering to the required quality system policies and procedures and, at any time, the agency may conduct an on-site audit of the laboratory facilities using project planning documents or methods cited therein as the performance standard or rely upon the audits of external accreditation entities (DEQ, 2019d). For laboratories contracted by DEQ for environmental data operations, a copy of the Laboratory Quality Assurance Plan describing the training programs and quality systems is maintained on file by the QA officer. In lieu of having formal laboratory accreditation/certification, DEQ includes a list of acceptable evaluations of competency and documentation in its QMP (DEQ, 2019d).

7.0 DATA MANAGEMENT

This section summarizes the primary data systems that DEQ uses to manage water quality data.

Commented [LT50]: What about needs to update any of these systems? WARD is one that comes to mind?

Also, while this list is helpful, I was wondering which of these are used for CWA decisions. Could that information be provided? It would be helpful to provide context for how these datasets are used and for what decisions.

7.1 WATER QUALITY DATA

Field Documentation

Internally collected field data is recorded using a suite of standardized field forms with project-specific variations. Most monitoring projects use a Site Visit Form (SVF) on which station metadata and all activities performed during a site visit are documented, along with site visit codes used to track activities completed during each site visit. SVFs often double as chain-of-custody forms used to track sample custody from the point of collection by field personnel to the point that samples are relinquished (delivered or shipped) to and received by analytical laboratory staff. Field forms are reviewed for quality control and scanned and archived electronically per project per field season.

Data Life Cycle

Internal data is managed through a data life cycle which includes project planning, sample data collection, sample submittal and analysis, results and reports, data verification and validation, data use or decision, and long-term storage (DEQ, 2011a).

Commented [LT51]: What about vol data or 319 data funded by MDEQ? How are those data handled?

EQuIS Water Quality Exchange (MT-eWQX)

DEQ stores surface water quality data collected by or with funding from DEQ electronically in DEQ's EQuIS Water Quality Exchange database (MT-eWQX); this includes water quality, toxicity, sediment chemistry, fish tissue, biological, sediment, habitat and other physical data. To support the management of water quality data in the Montana EQuIS Water Quality Exchange (MT-eWQX) database, DEQ developed a STORET User Data System (SUDS) which has a Microsoft Access platform and functions as a tracking tool that manages field visits, collected samples, and laboratory results. The SUDS database is

used to track all the field season metadata, activities, and results. Data is migrated from SUDS into the EQUIS Data Processor (EDP) application which is used to review and QC data before it's committed to the EQUIS database.

DEQ solicits water quality data and information during a biennial call for data in preparation for each biennial Water Quality Integrated Report cycle. During the call for data, DEQ notifies interested parties via an automatic mailing list service. Secondary data must be submitted to DEQ's MT-eWQX database in a specific format using the data submittal process (DEQ, 2010) and is screened to determine if it is suitable for use in making water quality assessment decisions based on the objectives, spatial and temporal representation, and rigor of quality assurance and quality controls applied during collection.

Water Quality Portal

Data loaded into the local EQUIS database is submitted (weekly) to the National WQX Warehouse (Water Quality Portal) (NWQMC, 2019).

Electronic Data Deliverables (EDDs)

Data must be submitted to MT-eWQX in a specific electronic format known as an Electronic Data Deliverable (EDD) per instructions found at [[HYPERLINK "http://deq.mt.gov/Water/SurfaceWater/SubmitData"](http://deq.mt.gov/Water/SurfaceWater/SubmitData)]. Data providers are required to download the MT-eWQX EDD and populate it with the project data to be submitted. Laboratories provide DEQ with raw results for each sample in an MT-eWQX compatible format after the samples have been analyzed.

7.2 ASSESSMENT DATA

Water Quality Assessment, Reporting and Documentation (WARD) System

DEQ developed the WARD data management system and uses this system to track beneficial use support determinations, impairment listings and delistings, TMDLs, and nonpoint source project implementation. This system links information with EPA's national Assessment, Total Maximum Daily Load (TMDL) Tracking and Implementation System (ATTAINS) (EPA, 2019) and is used to compile water quality information for DEQ's Water Quality Integrated Report (WQIR) to satisfy 303(d) and 305(b) reporting requirements.

Assessment, Total Maximum Daily Load (TMDL) Tracking and Implementation System (ATTAINS)

EPA's Assessment, Total Maximum Daily Load (TMDL) Tracking and Implementation System (ATTAINS) is an online system for accessing information about the conditions in the Nation's surface waters. ATTAINS defines the allowable domain values for assessment reporting, including parameter names, source names, delisting reasons, etc. DEQ uses WARD to submit water quality assessment outcomes, including use attainment and causes and sources of impairment, as well as the biennial Water Quality Integrated Report (WQIR) to EPA via ATTAINS. EPA also developed an online resource called How's My Waterway for the public to access data and information about water quality conditions based on the assessment information submitted by states via ATTAINS.

7.3 COMPLIANCE DATA

Safe Drinking Water Information System (SDWIS)

Public drinking water monitoring data are stored in Montana's copy of EPA's [[HYPERLINK "http://water.epa.gov/scitech/datait/databases/drink/sdwisfed/index.cfm"](http://water.epa.gov/scitech/datait/databases/drink/sdwisfed/index.cfm)] (SDWIS). SDWIS contains information about public water systems and their violations of EPA's drinking water regulations, as

reported to EPA by the states. These regulations establish maximum contaminant levels, treatment techniques, and monitoring and reporting requirements to ensure that water systems provide safe water to their customers. All data in SDWIS are geographically referenced and linked to potential contaminant source information.

Compliance Monitoring Data Portal (CMDP)

EPA's [[HYPERLINK "https://www.epa.gov/ground-water-and-drinking-water/compliance-monitoring-data-portal"](https://www.epa.gov/ground-water-and-drinking-water/compliance-monitoring-data-portal)] (CMDP) is a web-based data reporting system which enables drinking water utilities and laboratories to report compliance sample data electronically to DEQ more efficiently and with fewer errors.

Fees, Applications, and Compliance Tracking System (FACTS)

DEQ uses its [[HYPERLINK "http://deq.mt.gov/Public/FACTS"](http://deq.mt.gov/Public/FACTS)] (FACTS) to manage permit applications and renewals, including electronic fee payments and signatures, for all surface and ground water discharge permits. Permittees also report annual reports storm sewer overflow events, and other information into FACTS. Information is then reported by FACTS into EPA's ICIS database.

Integrated Compliance Information System (ICIS)

The EPA [[HYPERLINK "http://www.exchangenetwork.net/data-exchange/icis-npdes/"](http://www.exchangenetwork.net/data-exchange/icis-npdes/)] database is the primary repository used for Montana Pollutant Discharge Elimination System (MPDES) permit-related water quality monitoring data and is used to track violations of discharge permit limits.

NetDMR

All permitted facilities required to submit Discharge Monitoring Reports (DMRs) file them electronically with [[HYPERLINK "http://deq.mt.gov/Water/WasteWater/NetDMR"](http://deq.mt.gov/Water/WasteWater/NetDMR)] at a set frequency (e.g., monthly, quarterly, semi-annual or annual basis) depending on monitoring requirements specified in the permit.

7.4 SPATIAL DATA

Geographic Information System (GIS)

DEQ's [[HYPERLINK "https://gis.deq.mt.gov/portal/home/"](https://gis.deq.mt.gov/portal/home/)] is a geographically based system of people, technology, and data providing spatial awareness and decision making to support DEQ's mission. DEQ's GIS supports internal and external business processes for data collection, management, analysis, and public interaction through web-based services and mobile apps. Users can also access authoritative GIS information layers for various water quality programs and projects. All data collected by or for DEQ is paired with geospatial metadata to enable use of GIS tools.

DEQ also frequently uses a compilation of essential geospatial data that is maintained within the [[HYPERLINK "http://geoinfo.msl.mt.gov/home/msdi.aspx"](http://geoinfo.msl.mt.gov/home/msdi.aspx)] and vetted through the Montana State Library, including administrative boundaries, cadastral, climate, elevation geodetic control, geographic names, hydrography, hydrologic units, land use / land cover, orthoimagery, soils, structures and addresses, transportation and wetlands.

National Hydrography Dataset (NHD)

DEQ uses the National Hydrography Dataset (NHD) for surface water and hydrologic unit mapping. Monitoring stations and assessment units are associated with 1:24,000 high resolution NHD flowlines.

7.5 RECORDS MANAGEMENT

DEQ has a Records and Information Management (RIM) Policy to ensure that the agency's records are managed in an effective, economical, and systematic manner (DEQ, 2016b). According to this policy, DEQ will manage its records in accordance with applicable federal and state records and information management regulations and requirements, as detailed in the DEQ Records Management Plan (RMP) (DEQ, 2012). The purpose of the RMP is to document the requirements framework from which DEQ and its business units will create detailed, business unit-specific records management guidelines and procedures suited to their particular business processes.

8.0 DATA ANALYSIS AND ASSESSMENT

8.1 DATA COMPILATION

During assessment, DEQ considers all currently available data, including information or data obtained from federal, state, and local agencies, private entities, or individuals with an interest in water quality protection (75-5-702, MCA; 40 CFR Part 130.7(5)). Data is compiled and then reviewed (**Section 8.2**) to determine whether it meets data quality requirements and is suitable for use in decision-making.

Much of the data that DEQ applies during assessment is collected by or for DEQ by internal program personnel or contractors. DEQ also applies secondary data submitted to DEQ by other governmental agencies and interested parties including non-governmental organizations, volunteer monitoring programs, academic institutions, private entities and individuals. DEQ solicits water quality data and information during a biennial call for data in preparation for each biennial Water Quality Integrated Report cycle. DEQ also routinely compiles pertinent data for use in water quality assessment from the National Water Quality Portal (NWQMC, 2019) and makes reasonable effort to acquire data from other available sources.

8.2 DATA QUALITY ASSESSMENT (DQA)

DEQ's Beneficial Use Assessment Method for Montana's Surface Waters (Makarowski, 2020a) describes the process for evaluating the suitability of data for assessment purposes. DEQ modifies the list of impaired or threatened waters only if there is sufficient credible data to support the modification. Since 2011, DEQ has used a data quality assessment (DQA) process to determine if available data is of sufficient quality for making parameter-specific impairment determinations (DEQ, 2011). The DQA process is centered on four components that contribute to data validity: technical soundness of methodology, spatial and temporal coverage, data quality, and data currency.

DQAs are performed separately for each parameter group being assessed according to that parameter's assessment method specifications. Assessors use the WARD system (**Section 7.2**) to document the DQA outcome (pass or fail) for each parameter group being assessed per beneficial use. For inclusion in assessment decision-making, data must represent ambient conditions of the waterbody being assessed and therefore must be collected directly from the assessment unit itself and cannot be collected within the mixing zone of permitted point source discharges.

8.3 ASSESSMENT METHOD

Assessing beneficial use support as directed by the Montana Water Quality Act (75-5-702, MCA) and Section 303(d) of the federal Clean Water Act (33 U. S. Code § 1251) entails evaluating whether waters are meeting water quality standards for parameters associated with each use. Waterbodies that do not attain water quality standards for one or more parameters are considered impaired and are added to Montana's list of impaired waters. DEQ developed a Beneficial Use Assessment Method for Montana's Surface Waters (Makarowski, 2020a) which describes the process that DEQ uses to compile and analyze data to make attainment/non-attainment and use support decisions. DEQ's beneficial use assessment method includes:

- **Background and Definitions:** An overview of Montana's water quality standards and DEQ's water quality planning process which assessment is a component of.
- **Programmatic Approach to Assessment:** DEQ's approach for prioritizing and scoping water quality assessment projects and for delineating waterbodies for assessment.
- **Assessment Method Applicability:** A summary of the waters for which the assessment method applies.
- **Project Initiation and Information Gathering:** DEQ's process for soliciting and acquiring water quality data.
- **Data Quality Assessment (DQA):** DEQ's process for evaluating the suitability of data for assessment purposes.
- **Assessment Method:** DEQ's method for making beneficial use support determinations and impairment listing decisions for individual waterbody-parameter combinations.
- **Data Management and Reporting:** DEQ's approach to managing and sharing outcomes of water quality assessments.
- **Review and Approval:** The review and approval process for finalizing assessment decisions.

DEQ also develops and applies parameter-specific assessment methods to guide impairment decisions for specific categories of pollution (e.g., nutrients (Suplee and Sada, 2019), metals (Drygas, 2012), sediment (Kusnierz, *et al.*, 2013), and *E. coli* (Makarowski, 2020b)).

Commented [LT52]: What about needs in this section?
This is huge...

9.0 REPORTING

Table 3 summarizes key water quality reports that DEQ prepares routinely. In most cases, these documents are made available to EPA and the public via DEQ's website.

Table 3. Water quality reporting

Montana Statewide Water Quality Monitoring and Assessment Strategy: 2020 – 2030

Report	Timeframe	Comments
[HYPERLINK " http://deq.mt.gov/Water/Resources/report "]	Biennial in even-numbered years	Consolidated report satisfies Clean Water Act Section 303(d) (impaired waters list) and 305(b) (water quality status and trends and program summary) reporting requirements. The WQIR also summarizes Montana's water resources, reviews goals and successes of state water pollution control programs and presents ground water monitoring and assessment information.
[HYPERLINK " http://deq.mt.gov/water/surfacewater/UseAssessment "]	Modified as needed (most recently version in 2020)	Process for evaluating whether waters are meeting water quality standards and supporting designated beneficial uses, including data compilation, data quality assessment, and decision-making framework.
[HYPERLINK " http://deq.mt.gov/water/surfacewater/TMDL "]	Ongoing	Documents identify sources of pollution to impaired waters, determines how much pollution those waters can sustain and still fully support beneficial uses, and include pollution allocations and reductions. Most TMDL documents contain a framework water quality improvement plan that can be used to guide development of local watershed restoration plans.
[HYPERLINK " http://deq.mt.gov/Water/SurfaceWater/npspollution "]	Updated every 5 years (most recent version in 2017)	Describes DEQ's nonpoint source pollution control strategies, collaborative approaches, program priorities, and program evaluation; reflects new approaches and emerging priorities for addressing nonpoint source issues across Montana.
[HYPERLINK " http://deq.mt.gov/Water/SurfaceWater/npspollution "]	Annual	Reports on nonpoint source program achievements and activities. In recent years, DEQ has used Esri ArcGIS StoryMaps which enable digital story-telling and rely more on maps, images and simplified text to make these reports more consumable and informative for the public.
Quality Management Plan	Updated every 5 years and as needed	Documents DEQ's quality system to ensure that all environmental programs that acquire, generate, compile, or use environmental data and technology produce scientifically defensible, quality data that meets the informational needs and regulatory functions of the agency.
[HYPERLINK " http://www.cwaic.mt.gov "] (CWAIC)	Ongoing	Web-based compendium of water quality information; users can access current and past Water Quality Integrated Reports and search for individual assessment units to access assessment summaries and detailed assessment records.

Report	Timeframe	Comments
[HYPERLINK "https://www.arcgis.com/apps/MapJournal/index.html?appid=e209a1d52a644fa092ab1d3743a04ceb"]	Ongoing	Provides a sample of data and metrics that DEQ's water quality programs use to help gauge progress toward environmental protection and customer service goals; uses Esri ArcGIS StoryMap platform to present the information in a visually appealing format.
[HYPERLINK "https://www.epa.gov/waterdata/how-s-my-waterway"]	Ongoing	EPA developed an online resource with search and interactive mapping features to provide the public with information about the condition of their local waters. Assessment information that DEQ submits to ATTAINS, including beneficial use support determinations and impairment listings, is accessible via How's My Waterway.

10.0 EVALUATION AND IMPLEMENTATION

10.1 PROGRAM EVALUATION

DEQ periodically evaluates its monitoring program through systematic reviews of field activities, laboratory performance, quality control measures, and strategic planning and budgeting by managers.

Field Evaluation

- Hold annual meeting to evaluate the successes and challenges of the monitoring field season, highlighting quality control issues, lessons learned, and corrective actions; incorporate corrective actions into future monitoring cycles' trainings and processes.
- Conduct periodic field audits of field technicians, especially seasonal temporary staff and interns; accompany contractors or monitoring partners on early sampling events to ensure proper procedures are followed.
- Evaluate protocols and develop or revise standard operating procedures as needed.

Lab Evaluation

- Identify and address lab-related issues and implement corrective actions.
- Conduct comparison studies to evaluate differences in capabilities and sensitivity among laboratories, instruments and methods, as needed.

QA/QC

- Evaluate suitability of project objectives, sampling designs, and QC activities during annual review and approval of QAPPs and SAPs.
- Prepare QA assessment and oversight reports that summarize data usability per project (e.g., result qualifiers, lab and field quality control samples results).
- Prepare year-end or project completion reports that document any deviations from SAPs, data quality issues, and corrective actions.

- Conduct annual review of Volunteer Monitoring Support Program to identify needs/strategy.
- Evaluate monitoring within Quality Management Plan annual report.

Strategic Planning

- Review monitoring strategy every 3 years and revise as needed.
- Ongoing planning by management to determine short- and long-term monitoring priorities and to allocate resources (e.g., based on emerging concerns, legislative priorities, advisory group priorities, and stakeholder interests).
- Coordinate internally among water programs and solicit annual “call for projects” to identify monitoring needs.
- Meet annually with Statewide TMDL Advisory Group.
- Create annual monitoring budgets.

Assessment

- Apply collective decision-making approach during assessment to reach consensus and promote coordination among DEQ programs (e.g., with TMDL, Nonpoint Source, Permitting programs).
- Maintain detailed records of assessment data and decisions for repeatability and future reference.
- Review assessment decisions with EPA prior to submission of Water Quality Integrated Report.
- Prioritize and develop assessment methods in coordination with EPA.
- Discuss existing and readily available data and assessment approaches with EPA and other Region 8 states.

10.2 PROGRAM NEEDS

This section highlights several, but not all, needs for each program.

Commented [LT53]: I would like to see more detail for this section. This will drive funding so it's important to tie the strategy to the needs. What specifically is needed for these items? Please elaborate.

Water Quality Standards

- Strategy for nutrients
- Nonanthropogenic standards development
- Metal standards refinement
- Reference sites revisits and dataset enhancement
- Other standards development or refinement

Assessment

- Assessment methods (new or revised)
- Completion of assessments and Water Quality Integrated Reports
- Bioassessment metrics and thresholds (biocriteria)
- Methods to apply fish tissue and possibly other biological tissue data to assessment decisions
- Automated approach for compiling and screening existing and readily available data
- Process to solicit requests for assessment from the public and partners

Monitoring

- SOPs for emerging pollutants

- SOPs for lakes
- State term contract, annual work orders, and funding for laboratory services
- Trainings
- Equipment, pending technology improvements

Commented [LT54]: If these aren't in place, how does any work even occur?

Data Management

- Web-mapping application and reporting tools (e.g., for project evaluation reviews, water quality accomplishments)
- Qualitative habitat data management system
- Photo storage system
- Continuous data management (accessibility, storage of raw and corrected files)
- Additional filter groups for SANDS data mining application
- Electronic field forms
- Expanded use of EQuIS database across DEQ programs
- Geospatial information system tools, layers, and mapping (including DEQ mapping tool for water quality data and assessment information)
- Tools to efficiently access and compile secondary data
- Transition to WARD.net for assessment data input and ATTAINS submittal

Quality Assurance/Quality Control

- QAPP revision to reflect current practices and broaden applicability
- QA document tracking system
- Revise data quality assessment (DQA) in WARD

Coordination & Partnerships

- Internal coordination to identify priorities, select focus areas, implement projects, track improvements, and share data
- Monitoring partnerships and data sharing agreements
- Volunteer Monitoring Support Program resources
- Outside support needed periodically (e.g., statisticians, modelers, periodic intensive field efforts, special laboratory analyses, reporting)

Education & Outreach

- Data visualization and mapping tools for presenting data and decisions in visually appealing, accessible formats
- Website design and maintenance support
- Strategy for contacting landowners for private land access or project involvement
- Public outreach and communication skills training
- Professional development opportunities

10.3 SHORT-TERM PRIORITIES

Monitoring activities associated with several topics will be prioritized for allocation of staffing and funding resources in the short-term; others will be included as needs arise and as resources allow:

Commented [LT55]: Updating the QAPP seems critical but isn't listed here.

Nutrient Standards

Montana's numeric nutrient standards and variances (Circulars DEQ-12A, -12B) were eliminated from state law by the 2021 Montana legislature, and new statute requires the implementation of narrative nutrient standards. Nutrient sources and impairments are prevalent in Montana, and Montana has and will continue to prioritize strategic approaches to address nutrient pollutants. Montana will prioritize development of systematic approaches for implementing narrative nutrient standards, including the inclusion of response variables into MPDES permits and TMDLs via adaptive management plans. Adaptive management plans will likely require permittees to collect response variables (e.g., benthic algae density) as part of their permit conditions; this is a substantial change from prior permitting methods and will require input from Standards & Modeling (and Monitoring & Assessment) on targets and appropriate methods. Consultation with the Nutrient Work Group is initiating immediately (May 2021) and rulemaking under the new statute is targeted for completion by March 2022.

Nonanthropogenic Standards

75-5-222(1), MCA states that DEQ may not apply a water quality standard to a waterbody that is more stringent than the nonanthropogenic condition of the waterbody and, for parameters for which the applicable standards are more stringent than the nonanthropogenic condition, the standard is the nonanthropogenic condition of the parameter in the waterbody. DEQ will prioritize development of nonanthropogenic standards for salinity, arsenic, and possibly other metals in areas where those nonanthropogenic standards are applicable.

Metals Standards

DEQ has prioritized refinement of water quality standards for several metals, in particular selenium and aluminum:

- EPA has published updated aquatic life criteria for selenium. DEQ is evaluating whether adoption of updated federal criteria is appropriate for Montana waters with the exception of Lake Koocanusa and Kootenai river where selenium standards have already been adopted by the State.
- EPA published updated aquatic life criteria for aluminum in freshwater that reflects the latest science and allows states to develop criteria reflecting the impacts of local water chemistry (i.e., pH, hardness, and dissolved organic carbon) on aluminum toxicity to aquatic life (EPA, 2018). DEQ is in the process of evaluating whether adoption of updated federal criteria is appropriate for Montana.

Assessment Method Development

DEQ has prioritized the development of assessment methods that describe the data requirements, data analysis approaches, and decision frameworks to guide water quality impairment and beneficial use support decisions. Assessment method development requires support from the Water Quality Standards and Modeling Section for interpretation of numeric and narrative standards. Additional coordination is needed with the TMDL and permitting programs to ensure the impacts of assessment decisions on these programs are understood. A focus of assessment method development will also center on procedures used to compile, analyze and make assessment decisions using existing and readily available data.

Examples of current priorities for assessment development or revision include:

- Lakes (including eutrophication, dissolved oxygen, and pH)
- Harmful algal blooms
- Nutrients (including Wadeable streams, medium and large rivers)
- Fish tissue
- Dissolved oxygen

- pH
- Turbidity
- Temperature
- Habitat

Beneficial Use Assessments

DEQ has prioritized monitoring and data analyses that will enable beneficial use assessment decisions for the upcoming 2022 and 2024 Water Quality Integrated Report reporting cycles. Several study areas have been selected for targeted assessment-related monitoring, and additional areas will be identified pending further coordination among DEQ internal programs and stakeholder and advisory groups and evaluation of data availability.

Tracking and Reporting Water Quality Improvements

DEQ has prioritized approaches that aim to demonstrate measurable improvements in water quality, particularly those associated with activities supported by agency resources. A central component of the Monitoring and Assessment, TMDL and Nonpoint Source Program 20-year strategic plans includes a focus watershed approach in which resources are centralized to achieve and measure water quality improvements. Tools that can be used to efficiently and effectively track and report on these improvements are also being prioritized for development.

Current approaches used to track improvements include:

- Long-term trend monitoring (especially in large rivers and nonpoint source focus watersheds)
- 319 Success Stories
- Project Effectiveness Reviews (PERs)
- TMDL Implementation Evaluations (TIEs)
- 319 Project Load Reductions

Public Information Sharing

DEQ has prioritized the development of data visualization tools and other electronic resources to promote education, outreach, and information sharing with the public and stakeholders. Priority activities include:

- Redesign the DEQ Clean Water Act Information Center (CWAIC) website and create a new interactive mapping tool to share monitoring data, assessment findings, TMDL information, etc.
- Maintain the Water Quality Dashboard to share metrics and accomplishments
- Maintain and share authoritative geospatial data layers
- Expand the use of the EQulS database for data storage by DEQ water programs

PFAS Risk and Source Screening

DEQ has prioritized monitoring to screen for Per- and polyfluoroalkyl substances (PFAS). Mapping of potential source areas will be used to inform sampling designs. Monitoring will initially include public water supplies, surface water, benthic sediment, and remediation sites. Additional monitoring for groundwater, fish tissue or other media may follow. PFAS data will be compiled and mapped to display confirmed detections and exceedances of PFOS and PFOA drinking water criteria (and others as applicable).

10.4 LONG-TERM PRIORITIES

Short-term priorities described in **Section 10.2** are likely to have components that extend into the long-term implementation schedule. Additional long-term priorities include:

Water Quality Standards:

- Develop nutrient criteria in large rivers, lakes and reservoirs.
- Refine water quality standards as needed; incorporate considerations of site-specific conditions and use classifications.
- Develop standards for substances of emergent concern.

Assessment:

- Develop assessment methods, including contaminants of emerging concern and other priority pollutants.
- Complete assessments and submit Water Quality Integrated Reports by the submission deadlines.
- Identify bioassessment metrics and thresholds suitable for application during assessment.
- Develop an automated data compilation and screening approach using existing and readily available data from public databases (e.g., Water Quality Portal).
- Establish monitoring partnerships for long-term trend monitoring (e.g., large river).

Volunteer Monitoring Support:

- Provide training (e.g., data management, data analysis, sampling design, field methods) to heighten data quality and increase applied use of VM data.
- Develop and/or enhance data visualization tools to assist VM programs in using their data to achieve objectives.
- Conduct a statewide needs analysis to identify opportunities for volunteer monitoring and explore the possibility of initiating a DEQ-administered VM program.

TMDL:

- Explore opportunities for TMDL alternatives that could streamline the watershed planning process, particularly in watersheds where assessments have been completed and stakeholders are actively engaged in water quality improvement activities.
- Develop protection plans for areas with high quality waters facing risk of degradation.
- Reevaluate strategy used to prioritize watersheds and/or waterbodies for TMDL development.

Nonpoint Source:

- Explore opportunities for alternative watershed restoration plans that provide an effective roadmap to achieve the water quality goals of § 319-funded restoration or protection efforts; especially in areas where addressing an isolated, small-scale water quality problem resulting from one or a few sources of NPS pollution with active stakeholders addressing the sources.
- Implement NPS Focus Watershed approach in watersheds experiencing rapid development/growth.
- Expand statewide education and outreach for nonpoint source management.
- Identify opportunities to measure and report water quality improvements and gage increased public awareness of water quality issues.
- Enhance partnerships for performing, monitoring, and sharing information about restoration to increase statewide progress toward achieving water quality goals.

Wetlands:

- Integrate wetland program into the watershed planning process (e.g., assessment, TMDL, source assessment, and restoration planning).
- Refine protocols, metrics and reporting for wetland ecological assessments.
- Explore function-based classification systems and standards, and revisit state definition of wetlands.

Other:

- Identify opportunities for collaboratively reducing point and nonpoint source pollution in watersheds via coordination among WQD programs (e.g., optimization, incentives, funding).

11.0 GENERAL SUPPORT AND INFRASTRUCTURE PLANNING

Tables 4 and 5 depict DEQ's current capacity (FTE and funding) to implement the planning, monitoring and assessment, data management and QA/QC components of the federal Clean Water Act. These tables reflect only federal funds received from EPA. Other funding sources from other federal and state entities are also used for operational costs and staffing. Montana directs most of its PPG 106 allotment and all of its 319 NPS staffing grant towards (legislatively authorized) fulltime staff positions and relies heavily on the granting of 106 supplemental funds to perform monitoring and assessment activities.

Current Staff and Training**Table 4. Current staffing resources per funding source**

Program Staff	NPS Staffing Grant	PPG Grant – 106	Wetlands Grant
Fiscal/QA-QC	0.65	2.15	
WQ Monitoring/Assessment	10.00	5.00	
WQ Standards/Modeling	0.85	4.00	
Information Mgmt/Tech Support	1.10	3.00	
Watershed TMDL, Mgmt	1.26	3.00	
Watershed Protection/Mgmt	3.60		
Attorney Pool	0.13		
Regional Wetlands Program			2.00
Total	17.59	17.15	2.00

Training for permanent and temporary (e.g., seasonal field technicians) staff and often contractors is provided on an annual basis primarily by internal program staff. External training (e.g., communication, technical writing, statistics) is pursued as needs arise. Field and safety training occurs annually for all personnel conducting field work. Assessment activities are performed by internal program staff trained by assessment program staff and managers. Projected training needs include data acquisition from databases, lake monitoring methods, deployment and data management for continuous data loggers and other instruments, volunteer monitoring training and mentorship, emerging pollutant sampling methods, and harmful algal bloom monitoring methods.

Current Funding**Table 5. Current federal funding amounts per source**

Funding Source	Federal Funds
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NPS Staffing Grant	\$1,053,500
PPG Grant	\$1,495,973
Wetlands Grant	\$222,500
Supplemental 106, 2017-2021	\$312,360
Supplemental 106, 2019-2022	\$151,265
Supplemental 106, 2020-2022 /National Wetlands	\$337,930

Laboratory Resources

Laboratory support is based on a statewide term contract (7 years) for environmental services, the Environmental laboratory at the Montana Department of Human Health Services and the University of Montana. Work orders are developed under a common scope of work which specifies accreditation, analytical methods, reporting limits and method detection limits, electronic data deliverables, and other specific project requirements.

Future Resource Needs

The estimated program costs and staffing resource needs shown in **Table 6** reflect total need including funds from various federal and state entities. The addition of staff requires state authority for those positions from the Montana legislature.

Table 6. Projected long-term funding and staffing resource needs

Activity	Estimated Annual Program Costs (does not include 4% IDC)	Full Time Employees* (FTE) (assumption of 1 FTE = \$75,000)
Monitoring and Assessment	\$405,000	7
Volunteer Monitoring	\$62,000	N/A
Standards and Modeling	\$465,000	7
TMDL	250,000	7
Nonpoint Source	250,000	6
Wetland	150,000	2

*Additional resources are applied for seasonal temporary staff and student interns.

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